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On August 27 we announced that a prize of \$50 and a second prize of \$25 would be given for collections of handy shop devices, or "kinks," to be in our hands not later than September 25 for publication in our issue of October 1. Each collection submitted in competition must consist of not less than three nor more than five such devices, and the devices may be illustrated or not, just as the author pleases. The only requirement is that the contributor must have had personal experience with the device he sends in. This competition is specially designed to bring out the good ideas of the shop foreman and to put into circulation the labor-saving and efficiency-producing devices which have been developed in so many shops by individual initiative. We trust it will be as fruitful as the trainmasters' competition, just closed, which brought papers from from nineteen states.

Whether it is better policy to repair locomotives at home or to "farm out" the repairs, is one of the great questions of the day which railway mechanical departments have got to settle. The problem is much complicated by the fact that a certain amount of supervision is habitually given the railway mechanical department by officers who would be paid the same salaries whether the locomotive work was done at

home or away from home. On the other hand, in this age of specialization it seldom happens that the general shop can compete with the special shop in any branch of work, and the repairing facilities of the great locomotive builders are marvelously well organized, and can afford to undertake repair work as a by-product, at the slenderest margin of profit. We present this week the first of a series of articles dealing with this subject, which will be taken up again in our issue of October 1, from the opposite point of view. The Editor specially invites correspondence on this subject, which is none too clearly understood at present.

THE MODERN MACHINE TOOL.

In the majority of cases changes in customs and methods are brought about gradually through a change of environment or conditions, and it is seldom that a single epoch-making innovation is introduced to which the development that follows may be solely attributed, still such innovations do occasionally occur in all countries and in all industries, but usually with a gradual leading up to the period that makes the time ripe for the change.

The introduction of high-speed steel marked such an era in the history of machine tools and shop practice. Certainly the changes that have been made since that time have been rapid and wonderful. But it is not at all probable that machine tool designing would have been able to respond with the promptness that it did to the possibilities of the high-speed steel had there not been a preliminary training and preparation for its advent.

It is no reflection on the machine tool builders of thirty-five years ago to say that they were not designers, as we understand and do designing to-day. They built their lathes and planers and drills just as some other builders built locomotives by the rule-of-thumb. If a piece broke it was simply made heavier on the next machine, and when a larger and more powerful machine was desired it was also made heavier and stronger, but along the lines of previous designs that were used as patterns, so that a glance usually sufficed to tell whence a machine came. It was impossible to do otherwise, for there were no data extant to show what a machine could be made to do, what cut a steel could take or what power was required to do the work. Driving power was estimated, and estimated, for the most part, from the speed of the driving belt, and what that belt was supposed to be capable of pulling per inch of width—a method at once so unscientific and so unsatisfactory that no one placed any confidence in it. A shrewd guess at the shop power required in any given instance was far more dependable than these *quasi* calculations. But it must be remembered that technical training was rare, and it was not even realized that there might be a basis for a truly scientific calculation.

The result of this condition of affairs was that there was, as indeed there always will be, a wide variation in the results obtained. Occasionally it would be discovered that the ordinary tool was capable of taking a heavier cut at higher speeds than had been supposed, because a workman had taken a job by the piece, and the machine would be crowded until it stalled or broke. Then the tungsten steels came in, and builders who had been in advance of or fully abreast of the capacities of other steels found themselves lagging, and added strength to their machines. This was often done clumsily and without securing the results desired, and then came the inquiries as to what was necessary, and how the necessity must be met.

Then followed the scientific investigation, whose object was to determine just what loads were imposed by the cutting tool, what influence the shape of the tool and the size and speed of the cut had on those loads, and how the power needed to carry them could best be transmitted from the belt or motor to the cutting edge of the tool.

Much of this work had been done at the time of the advent

of the high-speed steel, at a period when the machines were far in advance of the tool. So when a trebled capacity was suddenly demanded, the builders were in a position to meet the demand. They did not have the needed data on hand, but they were equipped with the experience that taught them how to acquire it.

The result of this is that machine tool designing is now conducted in a far different manner from that of the old school. Its basis stands first upon the scientific determination of what has to be done, following out the many stresses involved until the source of power is reached. In short, the stresses are first determined for the skeleton of the machine, and then the muscles, in the shape of material, are built in about that skeleton in proper proportions to do the work with the margin of safety that must always be allowed, for overloading, abuse and other sources of destruction more or less illegitimate. The weight is ordinarily the last thing taken into account, for this must be subordinated to the machine itself and the work that it will be called upon to perform. Thus it will be seen that the business of machine tool designing has risen within the past three decades from a rule-of-thumb trade to the dignity of a highly refined and scientific occupation.

The very fact that this is so probably contributed largely to that other characteristic of modern work, the specialization and construction of machines for special work. The lathe, the planer and the drill are the three tools that are capable of a wide range of work, and are to be found in every shop. But of late years the reproduction in quantity has created a demand for special tools. Indeed, thousands of dollars are often spent for a high-priced, high-capacity machine tool of special design for the execution of a single contract, regardless of whether it will ever be available for another piece of work. And this specialization is one of the marked features of the modern tool. It is safe to say that there is no piece of machine shop work of the present day which has to be duplicated in quantities for which either a special machine is not available or which some builder is not ready to supply and to guarantee the output before the tool is delivered.

This change in conditions is the perfectly legitimate outcome of development along natural lines, and can in no way be attributed to the introduction of high-speed steel, but was a necessary preliminary, without which that steel would have fallen upon a market unprepared to receive it, and would have had to wait for a long time before it could have demonstrated its capacity. Even as it is, its introduction has been more gradual than many people suppose, and it is safe to say that greater advances have been made during the past two years than in the four or five that preceded them. Personal inertia, doubt and high first cost were the prime factors in this apparent delay. In fact, it was a case of indifference, in many cases coupled to the disposition to let well enough alone. We all know of innumerable instances where certain results are regularly obtained in one shop that another finds it impossible to duplicate. It is the old story of the man behind the gun. So, when the high-speed steel came in the same conditions were found to obtain, and it has taken time to overcome them. But we learn more rapidly now than we did in the days that are past, and the new gospel of high speeds and a heavy cut is permeating every shop.

It has already been stated that at the opening of this era the machine was ahead of the tool, but it was at once left far in the rear by the advent of the new steel. The catching up was, however, a simple matter; it merely meant a strengthening sufficient to meet the demand for a heavier cut, for speed has nothing to do with it. For a given cut the pressure at the tool remains practically constant, regardless of the speed. A machine capable of driving any maximum cut can do it at any speed, provided the power is supplied, and the question resolves itself into the very simple one of the motor. More speed, more power, and that power in almost direct pro-

portion to the speed. Hence, as higher-speed steels have been brought out, it has not been necessary to make a proportional increase in weight and strength of the machines, but merely to increase the amount of power delivered to it.

Closely associated with this development of the machine tool, but entirely separated and independent of it, is the electric motor. Twenty years ago the use of the motor for machine tool driving was a fad; a curiosity—something we failed to take seriously. Now it has become such a matter of course that when it is not used, especially on large machines, we ask why. It is evident, however, that the machine tool could have been developed to its present condition without the correlated development of the electric motor; but it was not, and the influence of that motor is to be seen on all designs.

Aside from the influence on the physical aspects of the machine tool, it is difficult to estimate the influence of high-speed steel on shop practice and shop output. It is very easy to fall into the error of attributing all of the wonderful results of recent years to its availability. This would probably be an exaggeration of its importance; still, its direct influence has been very great. Without arguing just how much credit is due to this one factor, it is safe to glance at what has actually occurred, and in this the output per machine of the same nominal size has increased from two to five times; an increase, the credit for which must be distributed between the greater skill that is brought to bear upon the work, the better adaptation of the machine to the work, and the capacity of the cutting tool. To take a concrete example. In the days of moderate things it was considered that to bore twelve or fifteen car wheels in ten hours was a fair day's work in a railway shop. This was afterward crowded up to twenty-five, and when fifty was reached we were all astonished.

A few piecework private shops had records of 100 wheels a day with a single cut, but this record was not generally credited. At that time the wheel seat was about 4 in. in diameter. At present 150 wheels a day can be maintained, and that with a 6-in. wheel seat. This alone adds 50 per cent. to the amount of metal removed, to which a multiplication of from one and a half to three in the number of pieces must be made, so that in this single element alone their work done amounts to $2\frac{1}{4}$ to $4\frac{1}{2}$ times as much as in earlier days.

This brings up another phase of the question—the capacity to get these large quantities of material to and from the machines and the capacity of the man to handle it. In this single item of car wheels, for example, the boring of 150 per day involves the handling in and out of about 37 tons of material, or 74 tons to be handled. Much of this has to be rolled in the old way, so that physical endurance here as in other places puts a limit to machine capacity. The result is that machinery for handling material has come into use to an undreamed of extent, and the traveling crane and power hoist is now used for a large number of minor lifts that years ago would have been executed without a thought by the machinist himself, or at most with the assistance of a helper. And thereby has been developed our present line of cranes and hoists.

This desire to expedite work, coupled to a virtual, if not conscious, recognition of the limitations of a man's capacity, has been responsible for the development of one of the most marked features of the modern machine tool—the facility that is offered for placing or chucking the work. We used to consider that the getting ready might well occupy from a quarter of to five times the time required for the actual doing of the work. But when this latter was divided by three it would have been an incongruous state of affairs if the time for chucking had remained unimproved. So we have resorted to every conceivable device to reduce this time, and the success has been remarkable. The turret for rapid duplication and a great variety of tool holders have annihilated the waste of time required for tool setting, and chucks of every conceivable design have robbed the setting of work of all its terrors and annoyances. As an instance of this, the motions for tool set-

ting on a single machine for a class of railway work have been reduced from 80 to 12, thus almost dividing the labor required by seven, and so enabling the man to keep the machine up to its capacity in a manner that would not have been the case had that extra and, as we now see, unnecessary labor been imposed upon him.

Of course, in this adaptation we have frequently heard prophecies of how certain tools were to be relegated to the scrap heap before the inroads of others, just as the electric locomotive was expected to have sent its steam predecessor into oblivion long ago. But somehow these tools do seem to survive. It was thought, just after the capacity of the milling machine had been discovered, that the planer would have to go. It is quite true that the miller has stolen or usurped a great deal of the old planer's work. But whether it were due to the spur of this competition or not, planer capacities have jumped into the air with those of other tools, and there seems to be an increasing demand for them, especially for heavy work. For light work the miller has pretty well taken the planer's place. So, while it is possible that the percentage of all the work done on the planer is less than it was, it is an undoubted fact that in actual quantity more is being done by it now than ever before.

It is impossible, within allowable limits, to take up the subject of individual classes of tools in detail, but enough has been said to show the remarkable advance that has been made all along the line.

In this connection a brief reference to the influence of this machine tool development upon allied trades is in order. Formerly the blacksmith was given dimensions within which he must keep his forgings. It was such an expensive matter, this removal of material, that its amount must be kept to a minimum. The result was that forgings were expensive; they were hammered and hammered and then reheated and hammered again, to save that extra eighth, to say nothing of the quarter inch, of turning. To be sure we obtained a lower finishing temperature and what worth it possesses, but we paid for it. Now the lathe removes material so rapidly and cheaply that it is far cheaper to buy many forgings rough turned than it would be to have them hammered to dimensions. Whether this is good for the smith's work as an art, or whether it results in a lowering of the grade of material, need not be discussed here. The one tangible and palpable result is that it has increased the capacity of the forge shop and made a corresponding reduction in the cost of the output, and this as a direct result of machine tool development. Pattern-making, molding and fitting have been affected in the same way. Output increased with no deterioration but a great improvement in quality.

In such a review of what has been and is being done we find a general tendency to increase of capacity by making the tools more and more convenient and easy of manipulation in the development of special tools and in keeping pace with the ability of the cutting tools to remove metal.

When such achievements as these are brought about the natural query arises as to why it was not done before. The answer is simply that we were not ready, and even if the designs had been made there would have been no market for them, nor indeed could many of them have been made. In this as in everything else the inter-relations of social and commercial life are strongly marked. It needed an advance in the art of steelmaking to provide the materials for the modern locomotive; it needed the modern locomotive with its weight and parts to create the demand for the heavy machine tools of the present day railway shop, and it needed the modern machine tool and its allied appliances to make possible the modern steel plant. So they have all worked together, and the advance of the one has always been accompanied by a forward step by the others. The modern machine tool with all the excellencies and wonders which it embodies is simply one example of the general advance of modern engineering.

MECHANICAL STOKERS.

In the discussion of the report on mechanical stokers for locomotives by the Master Mechanics' Association at its recent convention two or three points were made which seem not to have received heretofore the attention they deserve. In previous years the principal attention has been given to the consideration of whether it was possible for an automatic stoker to be so built that it will distribute coal over the grate surface in such a manner as to keep the fire in a satisfactory condition for supplying the steam demands of the engine. While a perfectly satisfactory stoker may not yet have appeared it is evident that mechanical officers who have studied the question most thoroughly are convinced that such a device is a possibility in the near future. This point was accepted by the committee having the subject in charge last year, as indicated by the opening sentence of its report:

"The mechanical stokers used on locomotives in this country up to the present time have at least demonstrated the fact that freight and passenger engines, in road service, can be successfully fired by mechanical means."

The committee endeavored to support its position by evidence from other countries, but was unsuccessful, and was forced to the conclusion that mechanical stoking had not made much progress abroad. The chief locomotive superintendent of the Great Western Railway of England said that he had tried some mechanical stokers, but with the lump coal used and the amount per mile consumed neither of the appliances seen had any prospect of superseding hand-firing. He added, as an important fact having a bearing on the question: "Our average consumption per engine mile over the whole railway is only about 40 lbs."

If an engine is required to consume only 40 lbs. of coal per engine mile, one of the principal reasons for experimenting with automatic stokers fails. This feature has been brought out in various ways during the last two years. That is, the principal reason for the search for a successful automatic stoker lies in the fact that a fireman cannot fire a modern heavy locomotive up to its full capacity, and the average capacity of locomotives is constantly on the increase. On the Southern Pacific, for instance, recent locomotives perform singly the service heretofore performed by two of the largest consolidation engines, and with such success that the original order for two locomotives has been followed by an order for twenty-one more. On account of the grade of the division on which they are employed it is probable that the speed is such that no especial difficulty is experienced in keeping up the fire; but if powerful Mallet compounds are capable of doing on a grade 12 per cent. more work than two of the heaviest consolidations, they are certainly capable of doing corresponding work on the level in hauling heavier trains at a higher rate of speed, provided their fireboxes can be supplied with the necessary amount of coal. One fireman cannot handle enough coal to keep one of these engines up to its full capacity except at a very low rate of speed. It was shown by Mr. Henderson during the discussion this year that such a locomotive could consume advantageously from 12,000 to 15,000 lbs. of coal an hour. The limit of the ordinary fireman is from 6,000 lbs. to 7,000 lbs. an hour, and it has never yet been found satisfactory to employ two firemen regularly on one engine. This would indicate that the extra expense of the large locomotive is wholly unwarranted, unless some adequate means can be found for working it up to its full capacity.

In its report for the present year the committee sums up this feature of the case as follows:

"The gradual retirement of old cars with structural weaknesses and the advent of improved draft gears and triple valves render it possible to increase train lengths without resultant troubles from trains parting; consequently it is reasonable to assume that the average tractive power of locomotives will increase. It is within possibilities, therefore, that the increased fuel consumed per mile will render it advisable to provide mechanical means for firing locomotives in order that they may develop a high sustained tractive effort and render the service attrac-

tive to men who possess qualifications to become successful locomotive engineers."

It has been shown on one western road that by the combustion of 150 lbs. per square foot of grate surface per hour on a consolidation locomotive the maximum tractive force can be carried up to ten miles per hour, but owing to the physical inability of the fireman to shovel more than 7,600 lbs. of coal an hour, or 135 lbs. per square foot of grate surface per hour the maximum tractive force could not be carried beyond 7½ miles an hour. Some calculations given by Mr. Henderson showed that on a Mallet compound, having 78 sq. ft. of grate surface and a tractive force of 68,000 lbs. at 15 miles an hour, which is deemed an economical speed for general operation, one fireman could handle 19,000 ton miles at a cost of 25 cents, two firemen 28,000 ton miles at a cost of 22 cents and the stoker 38,000 ton miles an hour at a cost of 22 cents. Therefore, with the slight additional cost of the stoker over that of one man at slow speeds a much larger amount of ton miles can be made, and at speeds of 15 miles an hour the cost of the stoker is considerably less than that of one fireman, and double the amount of ton mileage can be made with the engine.

It is possible that too much attention has been given to a possible saving in coal from the use of the automatic stoker. Though it would seem that under ordinary conditions uniform firing would save coal, yet if a much greater tonnage can be hauled, or the same tonnage hauled at a higher and more economical speed a few pounds of coal per mile more or less is a negligible affair. Any amount of coal the engine can use under these conditions may safely be fired without danger of impairing economy of service.

Little need be said of the effect upon the personnel of the service which would inevitably result from an amelioration of the fireman's duties. Difficulty is experienced on nearly every railway in getting the proper material from which to make enginemen. It does not require a Hercules to manage an engine successfully. It does require great physical power to fire an engine under present conditions, and a period of service on the left side of the cab appears to be the only satisfactory way of developing the knowledge and experience required in enginemen. If, however, the duties of the fireman can be made such that a man with more brains and education and less brawn can safely undertake them, the standing of the future engineman will be materially improved. There is an abundant number of suitable young men ready and waiting for a chance to run an engine who are barred by the limitations imposed by the requirement of an ability to shovel the enormous quantities of coal now burned.

As to the mechanical features of the automatic stoker, it appears that whatever the means employed for distributing the coal properly over the grate surface two other things are essential, viz., a practicable means of getting the coal from the tender to the stoker, and such an arrangement of the stoker as will permit of hand-firing in emergencies or in cases where the introduction of a little judgment will supplement the uniform but unintelligent operation of the stoker. It is obvious that but one-half of the function of the mechanical stoker is accomplished if the fireman must supply its hopper with coal. It is probably easier to do this than to throw the coal in at the firebox door, but it always affords the disgruntled fireman an opportunity to say that he might as well do the whole job himself and get the credit for it, whether he could do it as successfully or not. The difficulty with any sort of conveyor, of course, arises from the flexible connection between the locomotive and tender; but with the success that has been made of connecting so many other means of communication between the two there should be no insurmountable difficulty in bridging the space with a practicable conveyor, especially as, relieved of most of his present work, the fireman will have ample opportunity to see that the conveyor is working properly and to keep it in proper condition for doing so.

There are many places where it is desirable that there

should be opportunity for hand-firing. Standing on a siding or on slow freight trains there are times when the uniformity of the work of the stoker will be a detriment rather than a benefit. Mr. Crawford, of the Pennsylvania, who is experimenting with a stoker, is of the opinion that the automatic stoker will be about a 75 per cent. job; that is, it will be necessary to fire by hand about 25 per cent. of the coal used.

Until the present year the reports of committees of the Master Mechanics' Association on this subject have been confined largely to detail descriptions of the various appliances which had come under their observation. It appears now that the consideration has reached a point where the question of detail can be left to the inventor and manufacturer and the attention of railway officers can be given to the broader field involving general principles. What the mechanical stoker may be expected to bring about is summed up in the words of the present standing committee:

"A successful automatic stoker should render locomotive firing more attractive, raise the standard of the service, permit close attention to economical handling of fuel and reduction of black smoke, enable firemen to become better acquainted with the general duties of a locomotive engineer, and reduce tube and firebox troubles."

This, the progress already made, and the open mind of railway mechanical and operating officers on account of the possibility of securing the maximum capacity of the motive power in their charge, combine to make the field a most attractive one to the inventor and the manufacturer. It is probable that the report of the committees, which will be presented next year, will show a decided step in advance in the means supplied for meeting a demand which is unquestionable. In the words of Mr. J. F. Deems, general superintendent of motive power of the New York Central Lines: "If there is a demand—an urgent demand—for any one thing, it is for a successful mechanical stoker."

DEFINING THE POWER OF THE COMMISSION.

The United States circuit court for the seventh district, in its decision in the Missouri river and the Denver jobbers' case, held, in effect, that the Interstate Commerce Commission is not the traffic manager of all the railways. The Hepburn act gives the commission power to change a rate only when it has been shown to be (1) unduly discriminatory, or (2) unreasonable—*i. e.*, excessive. In the Missouri river case class rates from the Atlantic seaboard to points on the Missouri river were attacked on both these grounds. It was alleged that they were unduly discriminatory as compared with the rates from the Atlantic seaboard to Minneapolis and St. Paul, but the commission ruled that water competition to the Twin Cities was controlling and justified the roads in making rates there lower in proportion to distance than those they made to the Missouri river. No evidence was introduced in support of the contention that the rates were excessive; it was not shown that they interfered with the free movement of traffic, nor was it sought to show that they yielded to the road's excessive profits. The Denver case was similar, but the commission had espoused the theory that "a rate for a through haul should ordinarily be less than the combination of two or more local rates over the same lines." It applied that theory in these cases, ordering the roads in both instances to make proportional rates on through traffic lower than the corresponding local rates.

In so doing the commission tried to exercise a power greater than any railway traffic manager or number of traffic managers would try to exercise. The traffic managers have no ironclad theories of rate adjustment. Their only theory is that the rates of each community or section should be adjusted to the peculiar circumstances and needs of that community or section that have been developed by the interplay of economic forces. They do not try to make or to revolutionize conditions. They are satisfied if they can fix rates that foster the growth of industry and traffic on their lines. But the com-

mission, having adopted a theory of rates which it believed to be—and which may be—abstractly correct, set out to apply it broadcast. If the theory did not fit conditions, conditions would have to adapt themselves to the theory. It seems even to have assumed that it possessed, also, a greater power than the courts, for no court would hold rates unreasonable and order them reduced without taking or citing any evidence that they were unreasonable, except that they ran counter to its abstract theory of correct rate-making.

If the position taken by the commission were sustained almost all discretion in fixing rates would be taken from the officers of the railways. If it may legally establish and enforce the principle that the through rate must in all cases be less than the combination of local rates over the same lines, why may it not establish and enforce other principles requiring equally radical departures from past methods of rate-making? There would be nothing left for the traffic managers to do but to work out the details of adjustments the general plans for which the commission laid down. It is to be hoped that the commission always will be composed of able and upright men. But even were it always composed of men of the highest genius, possessing unsurpassed knowledge of industrial and transportation conditions throughout the country, and free from all political or other bias or influence, is it to be supposed that it would be capable of laying down the principles on which the rates on all the immense traffic moving over more than 200,000 miles of railways under the most diverse conditions should be handled? The circuit court holds emphatically that at least it does not possess power to do this now. All discretion in the fixing of rates, according to this decision, is still in the hands of the traffic managers. The commission can interfere with their work only to inquire if they have abused their discretion in specific instances by fixing rates that are too high or are unduly discriminatory. Its powers are to be strictly construed, and all power that has not been specifically given to it Congress has left where it was before.

A newspaper despatch from Washington says that "the decision came as a shock to the officers of the Interstate Commerce Commission," and that it had not occurred to any of President Taft's advisers "that the weakness exists in the law which has been disclosed by the Chicago decision." Among the President's advisers are such men as Jacob M. Dickinson, secretary of war, who formerly was general counsel of the Illinois Central, and Lloyd W. Bowers, solicitor-general of the United States, who formerly was general counsel of the Chicago & North Western. Six members of the Interstate Commerce Commission are lawyers. These gentlemen are familiar with the litigation and decisions affecting interstate commerce prior to the passage of the Hepburn act. They know that, with these decisions in mind, the question of how much power should be given the commission was debated at length in Congress while that act was on its passage. And, knowing these things, they know that the act, as finally passed, was intended, not to give the commission power to exercise a broad and general control over the discretion of the traffic managers, but only to give it power to prevent the abuse of their discretion. As the circuit court said, it was meant "to take away from the railways the power of life and death over the manufacturers and commerce of given localities, not to transfer such power to the commission or any other single body of men." Consequently, when the commission issued its orders in these cases its members must have known that it was stretching its legal power to the utmost, if not exceeding it. It seems not an unfair inference that they anticipated litigation in which the courts would mark off the utmost limit of their authority. Therefore, it can hardly be that they are "shocked" or even mildly surprised. That they are keenly disappointed, and will use the decision as an argument for giving them more power, is highly probable. It is characteristic of most bureaus and commissions that are established to regulate industry that they strive constantly to exercise more authority than the

law has given them, and then use the decisions of the courts checking them as arguments for legislation to give them the power which they have tried to usurp.

THE CHESAPEAKE & OHIO.

The Chesapeake & Ohio is a property which has been conservatively managed since its organization without foreclosure in 1888. In 1899 an initial dividend of 1 per cent. for the year was paid, and this dividend rate was continued through 1908. Nearly 70 per cent. of the tonnage of the road is bituminous coal, and during these years of careful management the coal business has been steadily built up. In 1899, the year of the first dividend, there was carried 3,600,000 tons of coal. This was 44 per cent. of the total tonnage carried. In 1909 there was carried 12,400,000 tons of coal, nearly all of which was bituminous. This amounted to 70 per cent. of the total tonnage carried. Considerable sums in the past have been paid out of income for additions and betterments, and especially has the company charged to income account large sums for equipment that might, under different management, have been charged to capital account.

During the past year Edwin Hawley and associates acquired about \$24,000,000 of the outstanding \$62,800,000 stock, giving them a working control over the property. This purchase was made not long after the sale by the Hawley interests of the Colorado & Southern, and at first there was considerable speculation as to what Mr. Hawley intended to do with his new property. The Hawley interests control the Chicago & Alton and the Toledo, St. Louis & Western, but it is not known that they control any road that connects this Clover Leaf-Alton system with the Chesapeake & Ohio. Under the Hawley management the Colorado & Southern was taken out of the hands of a receiver and developed through a number of years, put on a dividend-paying basis and sold. The Chesapeake & Ohio, on the other hand, when bought by these same interests, was already in a conspicuously sound financial position, and a study of the road and of its financial position now points to the conclusion that its purchase by progressive railway men was due to the possibility of developing the property either through the acquisition of some other road, such as the Chicago, Cincinnati & Louisville, which would give an entrance into Chicago and a connection with the Clover Leaf system, or simply through the adoption of a vigorous financial policy, which will give larger dividends to stockholders and at the same time improve the property and develop its traffic possibilities by charging larger sums to capital account.

From 1904 to 1909, inclusive, the company spent \$6,970,000 from income toward the payment of equipment trust certificates falling due and for new equipment, exclusive of renewals. During the same periods there was spent but \$3,770,000 for equipment from capital account. This is an average of \$1,190,000 spent from income per year and \$550,000 spent from capital for the five years prior to 1909. In 1909 \$1,005,000 was spent from income for the principle of equipment trust certificates and \$1,029,000 was spent from capital. Of course, it is too soon as yet to judge of what policy the new management will adopt in regard to charging larger sums for equipment to capital, but the figures that we give, together with the fact that during the 1909 fiscal year the dividend was raised from a 1 per cent. annual rate to a 4 per cent. apparently indicates that the new management believe that stockholders should now share to a larger extent than formerly in the earnings of the company.

Total operating revenue last year amounted to \$26,600,000, an increase of about \$800,000, and operating expenses amounted to \$16,400,000, a decrease of about \$800,000. This left a net operating revenue of \$10,300,000 in 1909, as against \$8,700,000 in 1908, and reduced the operating ratio to 61.5 per cent. in 1909, as against 66.5 per cent. in 1908. After deducting interest, taxes, etc., the net income amounted to a little over

\$4,000,000, as against \$2,800,000 in the previous year, and after the payment of twice as much in dividends (the dividend increase did not go into effect until the second half of the fiscal year) the company had a surplus of \$1,500,000 last year. In 1908 the surplus was \$1,200,000.

The return to more normal conditions in business, especially in the second half of the fiscal year, helped greatly toward larger gross earnings for the Chesapeake & Ohio, but it must be borne in mind that the business depression did not greatly affect the railways until about the middle of the 1908 fiscal year, and the full tide of recovery did not begin to set in until about the middle of the 1909 fiscal year, so that the improvement in gross earnings is more encouraging than the amount would indicate.

Most of this increase in earnings came from freight traffic, the increase from this source being \$1,300,000 and the total earned in 1909 amounting to \$20,900,000. Passenger earnings, on the other hand, decreased by about \$640,000 and totaled \$4,500,000 last year. This decrease in passenger earnings is, of course, explained by the fact that in 1908 the Jamestown Exposition was held, which gave a great deal of extraordinary passenger business to the Chesapeake & Ohio. This extraordinary passenger business was, nearly all of it, through

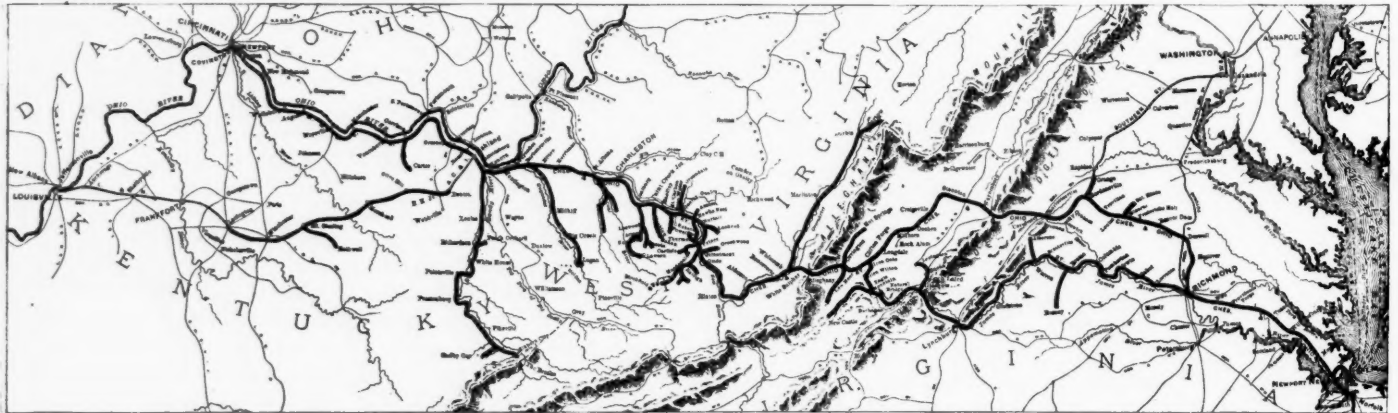
down to \$7,330,000. The unit costs of maintenance are given in the following table:

	1909.	1908.
Maintenance of way*.....	\$1,299	\$1,369
Repairs per locomotive.....	2,113	1,994
" " passenger train car.....	819	831
" " freight train car.....	63	74

*Per mile of first, second, third, etc., track, two miles of sidings and switch tracks being counted equal to 1 mile of main track.

The only cutting down of expenses here is in the repairs of freight cars, and this is a perfectly natural saving. A great part of the freight equipment of the Chesapeake & Ohio now consists of steel gondola cars, and as the former light equipment is weeded out and replaced by heavier and more modern cars, the expenses of repairs should be considerably reduced.

It does not appear that the new management has, as yet at least, departed from the standard of maintenance of equipment set up by the company in previous years. The company's report shows \$2,024 spent for repairs per locomotive in 1908, as against \$2,113 in 1909, but this does not seem an accurate comparison, since it can be seen from the detailed account of expenses that the 1908 figure included renewals, while the 1909 figure included repairs only. If we take repairs and renewals both, therefore, in 1909, we get \$2,277 spent per locomotive,



The Chesapeake & Ohio.

traffic coming from the carrying of northern visitors. Thus, while the number of passengers carried decreased by only 1 per cent. in 1909, the number carried one mile decreased 24 per cent. In other words, the average miles each passenger was carried totaled but 43 last year, as against 55 in the previous year. The average revenue per passenger per mile was 2.059 cents last year, an increase of 0.273 cents, or 15 per cent. During the year a compromise was made between the company and the state of Virginia, by which local passenger rates within the state were advanced from 2 cents to 2½ cents per mile.

The increase in revenue from freight carried was caused by an increase in the tonnage of nearly all classes of freight, the total number of tons carried being 18,500,000 in 1909, or about 12 per cent. more than in the previous year, and the average miles each ton was carried was 275, being only one mile more than in 1908. The average revenue per ton per mile from all freight was 0.410 cents, about 5 per cent. less than in 1908. The average trainload, already very heavy, was increased last year to 675 tons, or 54 tons more than in the previous year, so that notwithstanding that freight train mileage increased about 3 per cent. The freight revenue per freight train mile increased by 3 per cent., being \$2.766 last year.

The saving in operating expenses was fairly evenly distributed, the greatest proportionate saving being in the expenses of maintenance of equipment. The total spent for maintenance of equipment was \$4,900,000, which is about \$430,000 less than was spent in 1908. There was at the same time a saving of \$442,000 in expenses of transportation, bringing this figure

\$863 per passenger train car and \$65 per freight train car. During the five years previous to 1909 there was spent on an average each year \$2,081 per locomotive, \$979 per passenger train car and \$87 per freight car. This is probably somewhat less than the Norfolk & Western has spent in the same period, but it is quite evidently ample.

From the point of view of working capital, the Chesapeake & Ohio is in much better position now than it was a year ago. On June 30, 1909, there was \$3,900,000 cash in the treasury, as against \$2,197,713 on June 30, 1908, and total current assets amounted to about \$9,000,000, with current liabilities of about \$5,000,000 in 1909. This is an increase in assets of \$2,700,000 and an increase in liabilities of \$1,200,000. During the year there were sold \$840,000 general mortgage 4½ per cent. bonds and \$11,000,000 general refunding and improvement 5 per cent. bonds of 1909-1929, and there were canceled during the year \$9,750,000 general equipment and improvement bonds, due in 1917, which were deposited under 6 per cent. notes, of which there were outstanding \$6,600,000. These notes were called for payment on July 1, and the balance sheet, as of June 30, shows cash on special deposit against these notes of \$6,600,000.

There is now going on very keen competition for the hauling of soft coal into the south Atlantic states. During the past year the greater part of the Virginian Railway was put in operation and a considerable mileage was added to the Carolina, Clinchfield & Ohio. Work is being pushed rapidly on the C., C. & O., and since it has close financial relations with the Seaboard Air Line it bids fair to become an important factor in the competition for supplying the southern Atlantic states with soft coal. To meet this competition and that of the Vir-

ginian, the Norfolk & Western is building a line from Winston-Salem, N. C., to Wardesboro, to connect with the Atlantic Coast Line.

The Chesapeake & Ohio does not show which way the greater part of its tonnage of soft coal moves, but in 1900 about two-thirds of the tonnage moved east, and it seems probable that much the greater part of the coal tonnage still moves east. There does not seem to be much prospect of developing a territory for coal in the west by acquisition of some line entering Chicago. The middle west is pretty well supplied already with coal by such roads as the Hocking Valley, for instance, in which, by the way, the Chesapeake & Ohio owns a one-sixth interest. If the Hawley interests, therefore, do acquire an entrance into Chicago it will probably indicate that they mean to meet the competition of other soft coalers by making the Chesapeake & Ohio line less dependent on its soft coal traffic.

The following table gives a comparison of the operations in 1908 and 1909:

	1909.	1908.
Average mileage operated	1,897	1,841
Freight revenue	\$20,885,511	\$19,571,609
Passenger revenue	4,482,004	5,120,529
Total operating revenues	26,630,718	25,843,272
Maintenance of way	3,101,151	3,135,354
Maintenance of equipment	4,938,938	5,369,364
Traffic	466,042	470,957
Transportation	7,328,683	7,770,757
Total operating expenses	16,366,638	17,186,747
Taxes	801,600	791,061
Operating income	9,462,280	7,865,464
Gross corporate income	10,171,143	8,628,296
Net income	4,012,127	2,784,387
Dividends	1,255,814	627,907
Additions and principal equip- ment trust certificates	1,236,849*	165,927*
Surplus	1,519,464	497,553

*Includes \$19,400 Greenbrier Railway Sinking fund in 1909, and \$19,600 in 1908.

BROOKLYN RAPID TRANSIT.

Not only has the Brooklyn Rapid Transit got to meet the competition of the extension of the Interborough Rapid Transit's subway from Bowling Green, Manhattan, to the Flatbush avenue station of the Long Island Railroad, but it has also to meet a constantly increasing pressure of higher taxes and demand for a broader distribution of transfers. But, as was pointed out in the review of the annual report for 1908, the competition of the subway, while quite severe at first, has been an indirect benefit to the Brooklyn Rapid Transit by developing Brooklyn. The New York business man, living in Brooklyn, may travel back and forth on the subway, but his family are pretty sure to use the surface or elevated line of the Brooklyn Rapid Transit, and, therefore, every family that is induced to move to Brooklyn because of improved rapid transit furnished by the Interborough is a gain as well for the Brooklyn company.

The increase in taxes and the transfer problem is much more serious, and one of the ways of meeting this is to conduct a campaign of education. The annual report of the company for the fiscal year ended June 30, 1909, is the best example of perfect frankness on the part of a street railway company that we know of. If it were only possible to induce all the people of Brooklyn to read this report and make some study of the figures that it contains, it would go a long way toward solving the problem of education of public opinion. Especially ought this to be so in regard to the special franchise tax. This amounted to \$220,000 in 1908 and \$465,000 in 1909.

Total taxes were \$1,340,000 last year, an increase of \$400,000 over the preceding year. It is 10 years since the special franchise tax law was first put into effect and litigation is still in progress to determine how the amount of this special franchise tax shall be arrived at. President Winter says: "There being no method laid down in the special franchise tax law by which the tax commissioners are directed to value such property and the board persisting in its refusal to divulge their methods of appraisal, the resulting assessments seem to be largely a matter of guess work reached by no uniform rule

and occasioning great inequalities and injustice." Of the total taxes, \$1,030,000 are in a sense franchise taxes. This is equivalent to 35 per cent. of the net income for 1909. It is on such corporations as the Brooklyn Rapid Transit, now taxed just about to the limit, that the new corporation income tax of the federal government will fall particularly hard. It is estimated that for the 1909 calendar year this tax will amount to about \$50,000. Not only is the company taxed directly, but by being compelled to pay for the up-keep of the pavement on streets where it has got tracks, it relieves the city of about \$200,000 a year in payments for maintaining pavement, moving water mains, etc. This does not take into account the interest on about \$4,000,000 invested by the company in paving various streets which the city would have had to pay had tracks not been there.

The surface lines in Brooklyn, as in New York, are by no means as profitable to operate as the elevated, but it is on the surface lines that public opinion demands so much in the way of transfer privileges. The various subsidiary companies of the Brooklyn Rapid Transit are operated separately as far as the giving of transfers is concerned, and while the company has not been compelled, and probably could not be compelled, to issue universal transfers on the surface lines, nevertheless public opinion is so strong, that against its better judgment the management is compelled to issue a great many more transfers than it feels that the public is entitled to. Last year there were 530,000,000 passengers carried, for which the passenger traffic earnings amounted to \$19,000,000. This is an increase in the number of passengers carried of about 3 per cent., while the increase in passenger revenue over the previous year is only a little more than half of one per cent. This is largely explained by the fact that there were 141,000,000 transfers redeemed last year, an increase over the previous year of about 10 per cent. The average revenue per passenger was 3.60 cents in 1909 as against 3.68 cents in 1908. From these passenger earnings taxes alone absorbed a quarter of a cent in 1909 as against 0.18 cents in 1908.

Another drain on earnings is the furnishing of free transportation to policemen and firemen. Pass books containing 763,000 fares were issued to the police and fire departments for use by police and firemen in plain clothes, and it is estimated that the daily rides of uniformed policemen and firemen average about 7,804,000 for the year. If these fares had been paid the company would have earned somewhere around \$300,000 more last year.

The earnings of the Brooklyn Rapid Transit were adversely affected for about the first half of the fiscal year by the business depression and the effects of the panic of the year before, but since January gross earnings have shown substantial increases. Total earnings from operation amounted to \$19,700,000 in 1909 and \$19,900,000 in 1908. The decrease is accounted for by a falling off in earnings from express, the contract with the American Express Co. expiring on December 31, 1908, and not being renewed, and by the falling off in earnings of the American Railway Traffic Co., its contract with the city for the removal of ashes and garbage expiring on December 27, 1908, and not being renewed.

Operating expenses were \$11,400,000 last year and \$11,900,000 in the previous year. The greatest saving was in general operating expenses corresponding roughly to transportation expenses on a steam road, while repairs and renewals absorbed just about the same amount, 14.50 per cent., of gross earnings in 1909 as in 1908. After payment of fixed charges the company had a net income of \$1,940,000 as compared with \$2,074,000 in 1908. Only a little over \$65,000, however, was spent from income for additions and betterments last year as compared with \$230,000 in the previous year, so that there was available for dividends, \$1,870,000 in 1909 as against \$1,840,000 in 1908. Two per cent. in all was paid in dividends last year, the first dividend being declared in February.

During the year \$4,421,000 first refunding mortgage 4 per

cent. bonds were delivered by the trustee to the company and \$500,000 of these bonds were sold during the year. On June 30 the company had \$13,800,000 of its bonds in its treasury. Current assets totaled \$3,200,000 on June 30, 1909, as against \$4,400,000 in 1908, while current liabilities amounted to \$6,900,000 last year as against \$7,300,000 in the previous year. Of the current assets this year cash on hand amounted to \$1,500,000. This is rather a small working capital, especially with the amount of current liabilities that the Brooklyn Rapid Transit has. With the beginning of payments of dividend on the stock the credit of the company should improve so that it may sell part of its treasury bonds and strengthen its cash position.

The company is so evidently doing its best to provide adequate service and at the same time do what is right by its stockholders that we are inclined to think that the people of Brooklyn will some day come to recognize the fact and cooperate to a certain extent with the company.

The following table gives a comparison of the operations of the company in 1908 and 1909:

	1909.	1908.
Average mileage operated....	268	264
Passenger revenue	\$19,058,698	\$18,930,164
Freight, mail and express..	254,643	315,719
Total operating revenue	19,694,462	19,870,567
Maintenance of way.....	1,194,014	1,020,104
Maintenance of equipment..	1,690,916	1,837,550
Operating of cars.....	4,812,556	4,979,757
Total operating expenses	11,394,655	11,939,579
Taxes	1,337,620	930,007
Net operating revenue	6,962,187	7,000,981
Gross corporate income	7,568,005	7,678,805
Net corporate income	1,936,609	2,073,873
Retirements and additions..	65,430	229,781
Dividends	897,076	.....
Surplus	974,103	1,844,092

NEW PUBLICATIONS.

The Western Maryland—A Road Remade. Republished from articles in the *New York Evening Mail.* By Charles F. Speare. Pamphlet of 15 pages; 6 x 9 in. Price, 15 cents.

The general lien and convertible mortgage bondholders' committee of the Western Maryland Railroad is distributing Mr. Speare's interesting pamphlet describing the property, which takes up with considerable detail the reconstruction work which has been done during the last five years, the present equipment and the character of the traffic. Mr. Speare's pamphlet gives a clear picture of the road and is well worth reading.

Letters to the Editor.

PURCHASING AGENTS' REQUISITIONS.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The amount of advertising matter received almost daily by the purchasing agents of large concerns would create the impression in the mind of one uninitiated that all the manufacturers were holding an advertising festival. There are imitation typewritten letters, postal cards, calendars, blotters, rulers and catalogues of every different shape and size.

Of course, it goes without saying that the poor fellow who has charge of the distribution of all the mail matter does not have the time or the inclination to read through all the miscellaneous lot of advertising matter, and, without malice in his action, disposes of 95 per cent. of it in the waste-basket. Naturally, this is all that could be expected of the greater portion of advertising matter when it is received in such large quantities. But manufacturers have not spent their money—tens of thousands of dollars at a time in the compiling and securing of catalogues—without great hopes in the results to be obtained from their judicious distribution.

Some catalogues accomplish almost perfection in the way of

indexing, classification and general illustrations and descriptions. But, other so-called catalogues seem to be more of a pictorial study of the founding and growth of the business—telling of great length of the merits of the article in words sounding like the exuberant talk of an over-enthusiastic salesman—showing the officers at their desks, the reception room, etc., but sadly lacking in solid details such as sizes, weights, prices, prices of parts, numbers, etc., this information being crowded out by irrelevant matter that makes the book useless for the purpose of reference.

A person originating requisitions invariably relies upon catalogues for securing detailed descriptions, and when the catalogues in his possession are of the latter class, or are issued by a firm not representative in its line, difficulty will be experienced in putting the proper designation in the requisition and the latter's interpretation of same.

It is not the writer's intention to pass in any way on the relative values of the different classes of advertising. He touches on this point only to bring out prominently the need of better descriptive matter than mere references to illustrations in an obscure pamphlet or catalogue that is sent out broadcast like the testimonials of a cure-all remedy.

No one thing has added so much to the difficulties experienced by purchasing departments of large corporations in their unceasing endeavors to reduce to a minimum the expenditure of the time, labor and expense involved in the transaction of a purchase as this lack of sufficient information, and the burden of confusion, annoyance and delay resulting therefrom is not placed solely on that department, but, as in the case of a railway, is shared alike by the stores and operating branches of the service.

The purchasing department, unless the omission of essential information is obvious, takes it for granted that the originator of the requisition is familiar with the article called for and has given proper description of it, and, necessarily, the limited time at its disposal for the handling of hundreds of items on requisitions daily, is given to the questions of price, delivery, quality, etc.

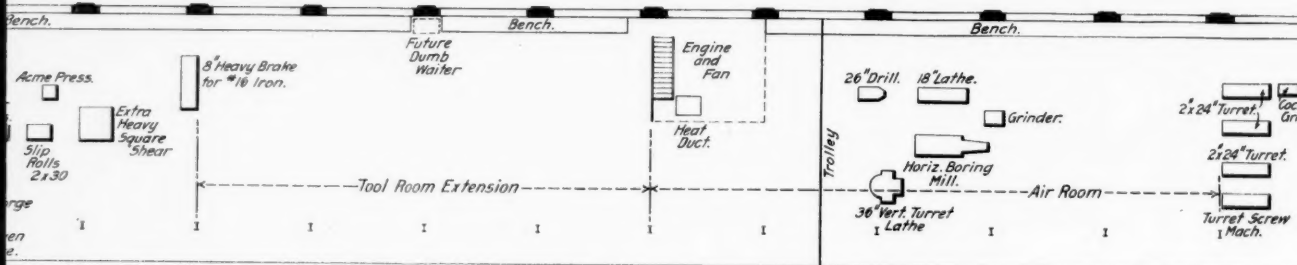
Covering items of ordinary purchase, few orders leave the purchasing department lacking in sufficient information, but where requisitions may call for intricate parts of machinery or specially manufactured articles of a somewhat complicated nature, these errors will creep through undetected.

In many instances, when called on for additional information by the purchasing department, the store department has to request the cancellation of the requisition owing to its inability to secure such information from the party for whom the material is intended, in which case a new requisition is issued at such time as the request for complete description is complied with. Too much stress cannot be placed upon the importance of accuracy and detail in description by the part of the person making out the requisition.

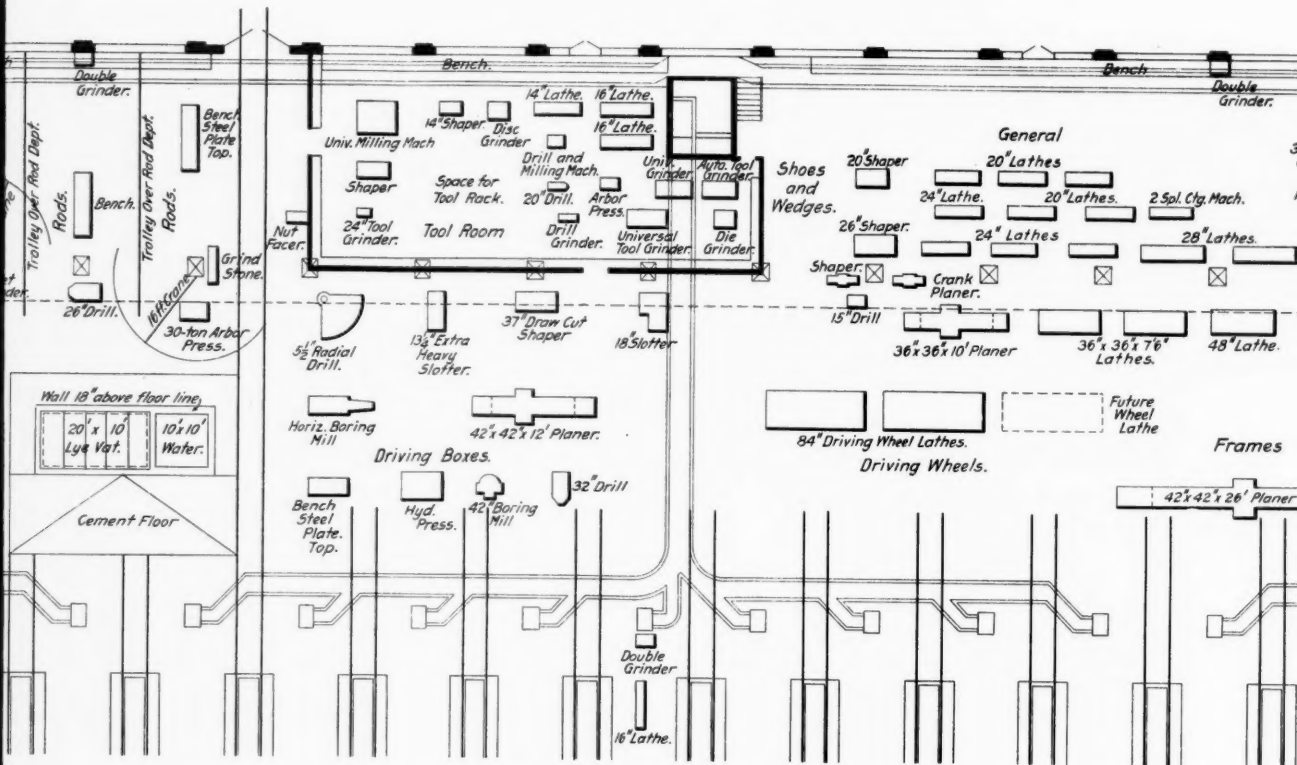
The most satisfactory plan is to make reference if possible to an illustration in a catalogue of one of the leading manufacturers or jobbers of the article wanted. Be thorough as to dimensions, composition, etc., and also in indicating the use to which the article is to be put and a possible substitute, as it affords a definite guide to the purchaser and enables him to decide intelligently upon the proper substitution of some slightly varying size or quality when the exact material required cannot be promptly obtained without the unnecessary waste of time and stationery consumed in the effort to ascertain what will or will not answer as a possible substitute.

The general storekeeper is responsible for this accuracy of description and should see that the requisitions sent from his office to the purchasing agent are so complete in the descriptions of the various articles that even a man who is wholly unfamiliar with the details of shop practice or road work could make no mistake in deciding exactly what he was expected to procure.

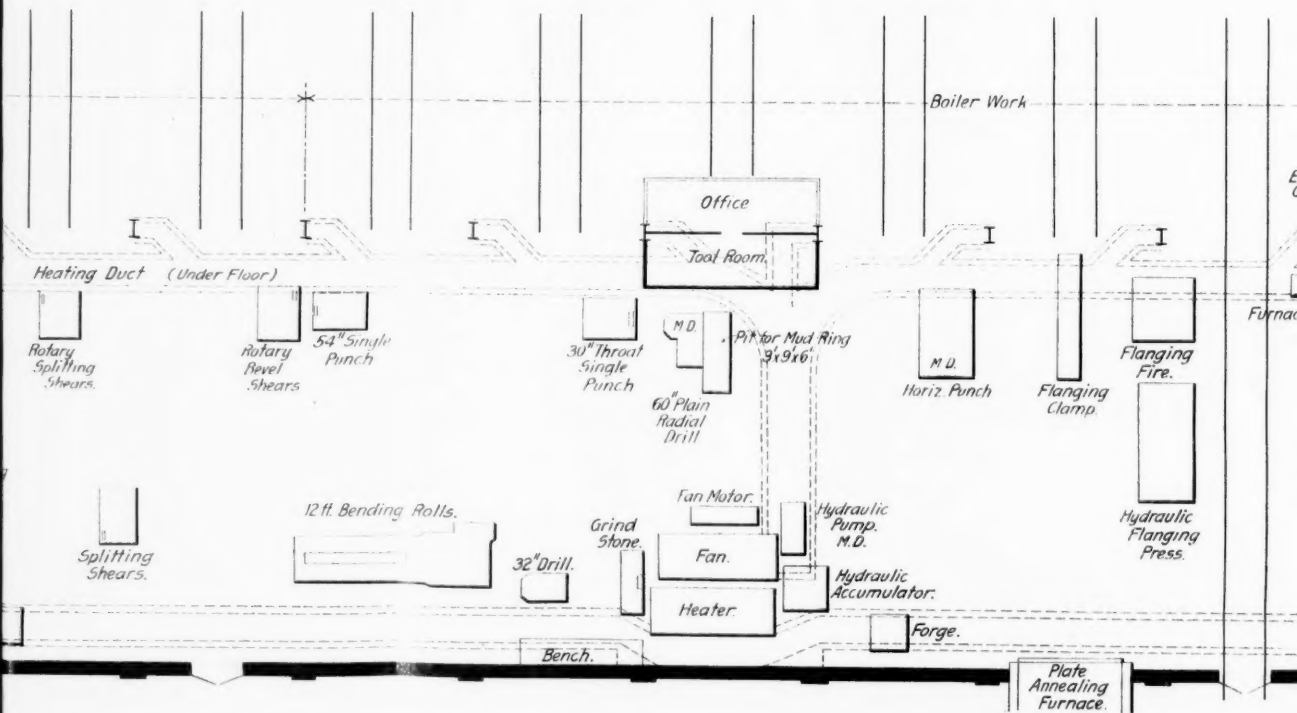
Many times the person making the requisition is so familiar



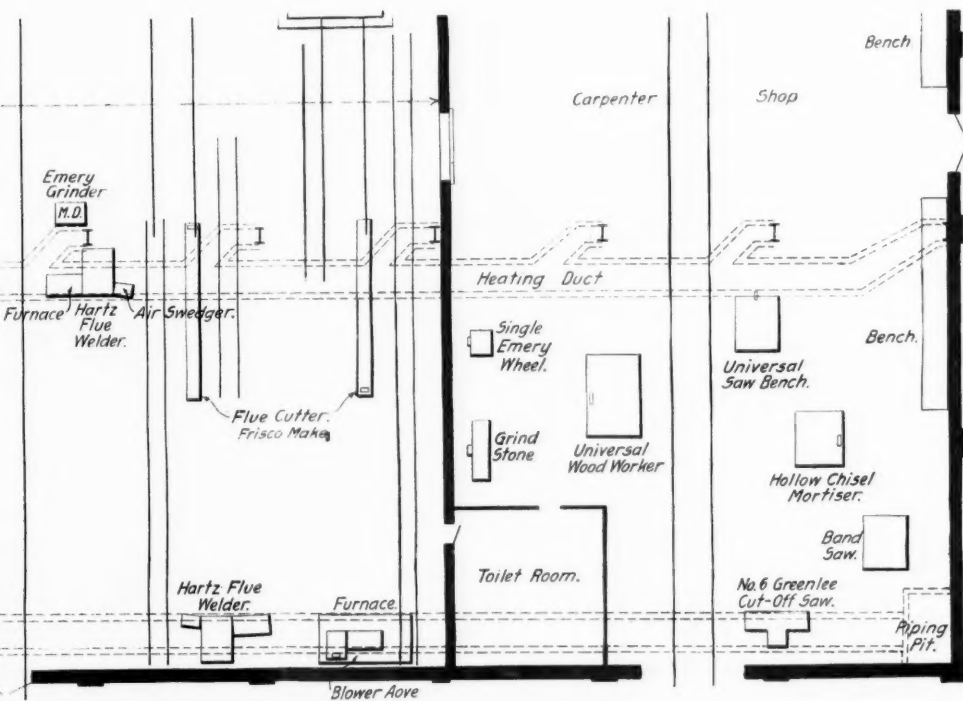
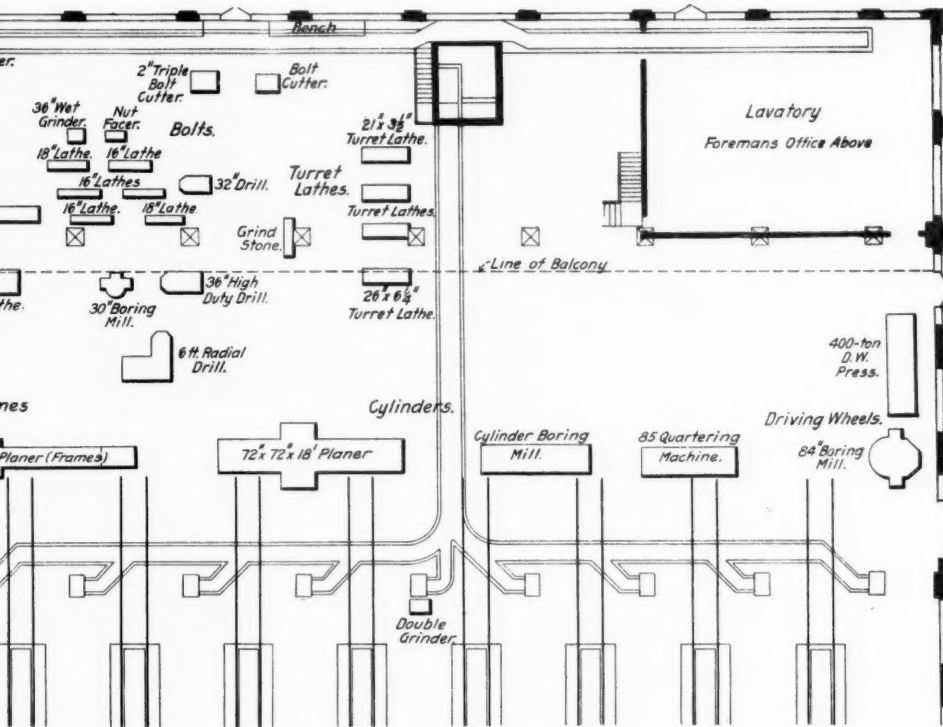
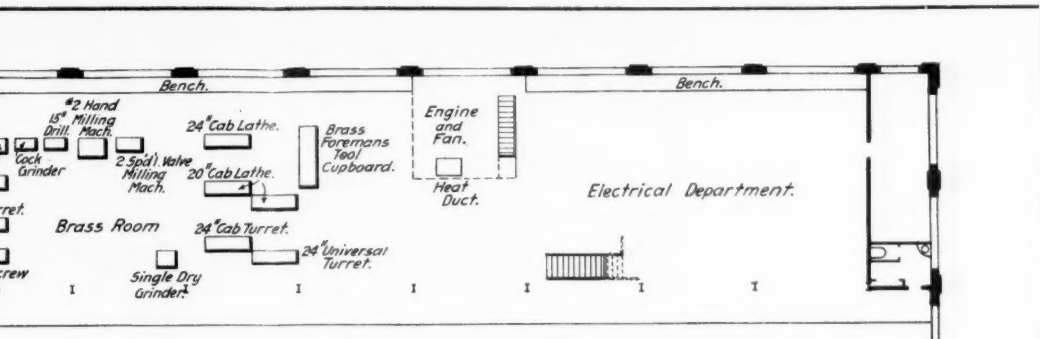
Plan of Balcony.

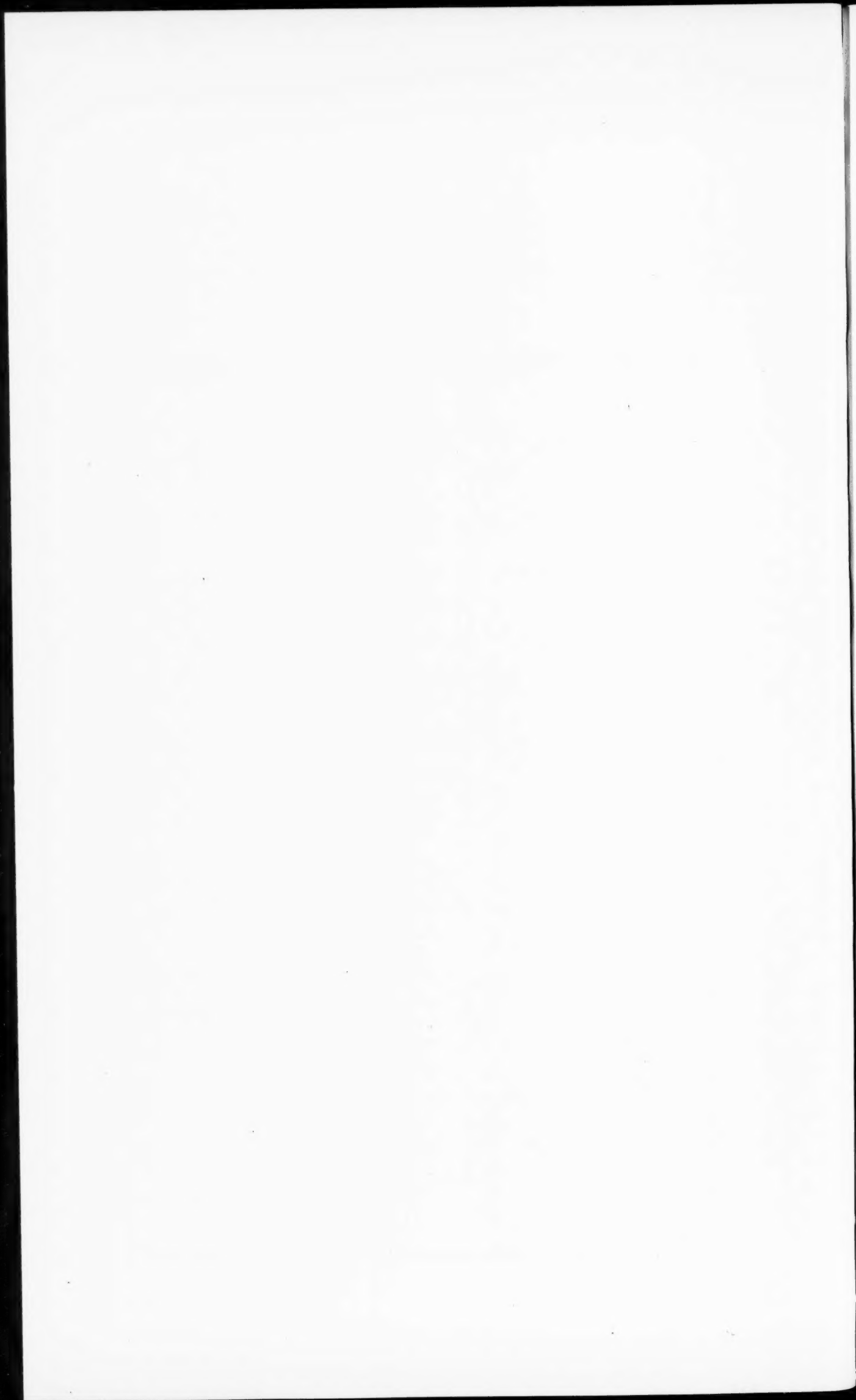


PART PLAN AND LOCATION OF TOOLS; SPRINGFIELD, MO., SHOPS.



PART PLAN OF BOILER SHOP. SPRINGFIELD, MO., SHOPS OF THE FRISCO SYSTEM.





with the exact details of the articles which he is using in his daily work that he considers any explanation or careful description of them as superfluous and a waste of time and energy. He does not realize that the operation which he is daily performing, and which seems so simple to him from his long familiarity with them, is often the object of amazement and wonder to the man whose life is spent mainly at a desk and whose efforts are largely in the direction of endeavoring to grasp and understand the practical things with which he is concerned.

To facilitate the requisitioning of material one of the leading railways has had compiled and printed for general issuance a catalogue or record comprising all the different materials and their parts in use on the system. As a reference guide in ordering this book will prove of incalculable value, tending to a gradual decrease in the volume of correspondence carried on between the stores and purchasing departments on the subject of items on requisitions not being clearly defined, as directions are very explicit as to just how the article is to be specified and what information is absolutely essential.

It greatly simplifies matters when requisitions contain reference to an article listed in one of the standard catalogues or where samples are submitted or previous requisitions referred to, stating the purpose for which the article is intended and a possible substitute.

Delays which sometimes prove very costly are sure to occur where time is consumed in securing more definite specifications and, in the opinion of one who has handled and sold railway supplies for many years, nothing is more unpleasant than to receive an order lacking in one of the important features of description of the article to be furnished, as it is a known and established fact that when the purchasing department is acquainted with the seller's need of additional information they become slightly skeptical as to the seller's knowledge of his goods and his ability to serve them in the matter satisfactorily in all respects. In such cases it sometimes amounts to almost practice to request the order returned for cancellation and to have the same placed elsewhere, only to receive from the latter source a similar request for information.

In many instances, manufacturers, guided solely by the specifications received, have shipped an article wholly unsuitable to meet the requirement and thereby lost a customer that it required a great deal of time and perseverance to secure.

A great many obstacles in the way of rapid and satisfactory handling of purchases through purely routine channels, as enumerated in the foregoing, would be obviated by affording opportunities to the employees of the store and purchasing departments, to familiarize themselves in a practical manner with the class, purpose and service of different materials by spending much of their spare time out in the shops studying closely the work performed by the various mechanics and, wherever possible, obtaining their views and explanations of different contrivances.

Much depends upon the storekeeper becoming thoroughly familiar with shop and road work and with the practice of the signal department. His personal acquaintance and daily intercourse with all of the foremen in his territory who are drawing supplies from his stocks is a vital necessity to the proper conduct of his business and will result in such an intimate acquaintance with their requirements of all kinds of material and the uses which they are put, that he can himself recognize an inaccurate description immediately or suggest the possible use of an article less expensive or more suitable, and thus save confusion and expense by applying the remedy before the requisition leaves his hands.

Knowledge obtained in this manner is lasting and valuable. It places its possessor in a position to know thoroughly and be interested in the daily work he is performing and to fit himself for deserved promotion.

G. S. W.

Contributed Papers.

REPAIRS TO LOCOMOTIVES BY CONTRACT SHOPS.

In recent years there have been a number of cases where large batches of locomotives have been repaired for various railways at shops of locomotive builders or where locomotive repair work is done by special contract, instead of the regularly recognized method of having repairs made by the railway companies directly at their own shops, and the additional fact that there have been plants erected or prepared for this express purpose causes us to consider the outcome of this departure from the customary order of "doing things."

Is there really a tendency for the railways to "farm out" the repairs to their equipment, or are these cases merely sporadic and brought about by certain conditions or combination of conditions?

Is there really a tendency for the railways to "farm out" side shops?

What classes of repairs can best be given out and what can best be done at the home shops of the railways?

Will this system tend to increase or decrease in popularity?

These and doubtless many other questions will arise in connection with this subject and it may be of interest to consider some of them at this time.

In 1904 the Erie Railroad made a contract with the American Locomotive Company for the repairs of 600 locomotives. This was to be at the rate of twenty-five per month, which would extend the work over about two years' time and was the largest arrangement of this kind which had been consummated, at least, up to that time. It is very often that repairs have been done by locomotive builders for different railways, as, for example, the repairs made by the Montreal Locomotive Works for a number of locomotives belonging to the Canadian roads, repairs made by the Providence and Manchester shops of the American Locomotive Works, for the New York, New Haven & Hartford and other New England roads, and the Scranton & Patterson Works for the Lehigh Valley, Ontario & Western, Schenectady Works for the New York Central, and the Richmond Works for southern roads. The Baldwin Locomotive Works had often made repairs to locomotives for their clients and small roads generally, without proper shop facilities, send their locomotives to the builders when conveniently located, or to some accommodating railway in the vicinity which is provided with ample shop requirements and a disposition to do a little outside work.

There are a number of small railways in this country which own so few locomotives that it would not pay them to build and operate costly repair shops, and these roads naturally must turn to their connecting roads, locomotive builders or shops which are competent to repair such engines. These small roads, however, are gradually becoming fewer in number every year as they are acquired by larger roads and in time become parts of large systems which have ample shop facilities. The ordinary running repairs can be made as usual in roundhouses with a very small amount of tool equipment, but large roads cannot afford to be without shops of their own where the work will be done under their own supervision and when such corporations turn to locomotive builders, the case is of unusual interest.

Not only has the number of locomotives been increased very rapidly within the last five years, but also the size of such engines is growing to such an extent that it makes the shop problem one of more difficult solution. The following number of locomotives have been ordered during the last five years:

Locomotives.			
Year.	No.	Year.	No.
1904.....	2,538	1907.....	3,482
1905.....	6,265	1908.....	1,182
1906.....	5,642		
Total for five years		19,109	

In 1904, according to the Interstate Commerce Commission's report, there were about 47,000 locomotives in service in the United States, from which it appears that the percentage has been increased by about 40 per cent. in the last five years, not allowing for the small number of engines that have been scrapped or retired, as it is often the case that old engines, which are rather too light for service, can be sold for lumbering or other industrial purposes, and the actual number of engines which are annihilated within a year is comparatively small.

In 1904, 611 of these new locomotives were over 100 tons in weight. In 1905, 1,598 were over the 100-ton limit. In 1907 and 1908 the effect of hard times was felt by the decreased orders which were given, but there were 943 in the former year and 453 in the latter year over 100 tons weight, so that while in the year 1904 only 24 per cent. of the locomotives ordered were over 100 tons, in 1908, 38 per cent. of the engines ordered exceeded this weight. This illustrates the enormous increase of work which must necessarily be thrown into the repair shops, none too large before, as it has always been a very common thing for many engines to be standing on side tracks, waiting their turn to go into the repair shops, even on roads that have been considered well equipped for this work.

It is a well-known fact that it is very much easier to obtain money for rolling equipment than for shops and tools, and it must also be considered that comparatively few shops were prepared to handle the great increase in size of locomotives, which has come upon us within the last two or three years and which has, no doubt, been stimulated by the unusual efforts made recently to operate at a minimum of expense. As an example, we well remember a very important roundhouse at the top of a heavy mountain grade in which the electric lights had been removed for the sake of economy and also we have in mind a number of roundhouses at the ends of divisions 150 miles long which had no machine tools for making even running repairs. Those who are interested and have followed the question of shop construction know that while there have been many good shops built in the last five years, yet these facilities have by no means kept pace with the number and power of engines in service, and that by no possible means could the increased facilities take care of this additional equipment. Heavy locomotives require special machinery for properly and economically repairing their parts and also facilities for handling the engines in stripping off fittings and it is no wonder that many railways have had to look for outside assistance when their facilities were overburdened with large numbers of heavy power requiring continual care and repairs. Those companies who have added largely to their shop plant are able to cope with this unusual influx of locomotives, but the roads that have paid little or no attention to this important part of railway operation have been in a pitiable condition for taking care of their equipment.

The new types of locomotives which have made their appearance in the last few years require many new patterns, and as a great many roads have purchased only a few of such locomotives in order to test their suitability for the particular service for which they could be used, it hardly paid them to make the great number of patterns required, and this was another incentive to have recourse to the builders' shops for repairs. Under these adverse conditions, the superintendent of motive power was glad to take up any means of relief that was offered and, conversely, locomotive builders have been glad, within the last couple of years, to obtain almost any grade of work which would keep their shops in even partial operation.

As a rule, private corporations are very much more ready to spend money in shop improvements than railway companies and while much money is applied to the purchase of new equipment, yet ordinarily but little can be obtained for increased shop facilities. This policy is often effective even in

new lines of railway, which are being built with little regard to cost. A road which has been recently constructed, with practically 100-lb. rail throughout and very easy grades, regardless of cost per mile, could obtain but the most meager appropriation for shop facilities, even although cars were purchased by the thousands. In busy times it is very often hard for the railways to get competent men to work at their various shops, and particularly in the outlying western districts, as private corporations will often pay more and have the advantage of employing their men in more agreeable living places. Then, again, after a road has its shop well organized and equipped for handling the work, a falling off in business, even though sometimes slight, is followed by an order to cut the forces. Then, when business demands the use of all the equipment possible, it is difficult to reorganize the department in the short time desired, and the repairs must necessarily suffer.

The great difference between handling of improvements by railways and by private corporations was well illustrated a few years ago when the Schenectady Locomotive Works, during a dull period, and with not a single order for a locomotive on their books, pulled down their old shops, rebuilt new ones and furnished them with up-to-date, modern, heavy machine tools. How many railways, during the dull season are employing men to so thoroughly rehabilitate their equipment so that they can make the best use of it when the rush season comes? Instead, however, financial interests generally require such a cut in the pay rolls that there is practically only sufficient force left to make running repairs of the most important character, and then, when a sudden call comes for increased business, the equipment must be patched and "cobbled up" in order to attempt to do its share of the work. It is well known that while an increase of business on a road can be handled with a small proportionate increase of expense, yet, on the other hand, when business decreases, it is practically impossible to diminish expenses in the same proportion, as a railway must operate under all conditions and must keep its official organization, even if the amount of traffic is one-half or one-quarter, of what it is under ordinary business conditions. Manufacturing plants, on the other hand, can simply close down, as they are under no obligations to the public to operate at a loss, and therefore have much the advantage over railways from an operating financial point of view. All this puts the superintendent of motive power in a great quandary, and when repairs must be made, he cannot wait to build shops, even if the money were available, and must take advantage of whatever opportunities present themselves to get the work done.

The question of the relative economy of these methods of making repairs to locomotives will probably be a difficult one to answer, as shop costs to a railway are susceptible to so many and such varied interpretations. When contracts are made with outside works for repairs to locomotives, they are generally on a "cost plus a percentage" basis and the actual expense to the railway depends, very largely, on what is considered as entering into the "cost." Certainly supervision and general shop expense and maintenance should be included, and this latter may run from 50 per cent. to 60 per cent. of the actual time consumed in the productive labor. Some contractors, not particularly referring to locomotive repairing work, charge in their supervision, their stenographic and office expenses, and their own time when devoted to that particular work at a daily rate, and then to all these add the percentage of profit. This, it would seem, is a very liberal interpretation for the contractor, who, in event, has nothing to lose and everything to gain. All the conditions for such an arrangement should be set forth in the contract, but ordinarily there is no special inducement to keep down the cost of the work, especially when the profit is based on a proportion of the cost of this work, as the greater the cost, the greater the profit will be to the parties making the repairs.

In a railway shop the cost of repairs to a locomotive is generally based on time and material with a small percentage for handling the latter, but supervision generally, that is, the pay of the superintendent of motive power, the master mechanic, office clerks, etc., is generally not included or prorated, on this work, nor should they necessarily be so, as the road duties of these officers would require their attention under any circumstances and they would, no doubt, be needed even if no general repairs were made by the railway company. The amount of uncharged time or "surcharge" may be considered in very different lights and one may be practically as correct as the other. Ordinarily, large roads must have some shops which will require a certain amount of supervision and this general expense could not be eliminated by doing a portion of the work outside. As a rule, a large number of men require less supervision in proportion than a few, so that the increase in shop work always brings about a reduction in the uncharged time and distributed expenses per unit of work done in the shop.

Accountants and experts claim that all of these general expenses and time of the general officers should be added to the cost of shop work, but we believe that when it is desired to compare the cost of doing the work in the home shop with what the same parts can be purchased for outside, it is only proper to add to the actual cost of labor and material such charges for supervision and maintenance expenses as would actually be increased, were this particular work done in the home shop of the railway company, or such that could be omitted or saved if the work was given to an outside concern. If it were a question of building new shops, the case would be somewhat different, as the cost of financing the construction would be a very important consideration. Assuming, however, that labor would receive the same remuneration in the railway shop as in the locomotive builders' shops, and materials would cost the same, the work should be done even cheaper in the railway company's shop as no additional organization is required to be paid for and no profit is to be allowed and the uncharged time would be only partially distributed over the work done at home.

The cost of additional movement from the railway to the builders' shops, if far away from the line, would, of course, be considerable and would be an additional incentive to the railway company to save these charges by doing their own work. The advantage of personal supervision of the superintendent of motive power and master mechanic, which could not conveniently be given at the builders, the observance of the wear and maintenance of the different parts with the consequent advantages in being able to follow up the improper handling of locomotives on the road as shown by such wear, the composition of special metals, etc., would be more or less vitiated when not under control or supervision of the mechanical department. Under these circumstances, it is certainly very questionable whether there is any real economy to a railway company in having this work done outside in contradistinction to doing the same at its own shops, provided they are well managed and efficiently operated.

The class of work which recommends itself to be done at an outside shop is undoubtedly that known as general repairs, or rebuilding with new boilers and new fireboxes. Running repairs are out of the question and light repairs can generally be made by the roundhouse and terminal men used on running repairs when the latter work is slack. Locomotives often come to the terminal headquarters in "fleets" and sufficient men are required to jump in and prepare them for subsequent trips, and when they are gone these men can be well employed in making light repairs to other engines which are held for this purpose.

Then many railway shops are not fitted up for handling heavy boiler work and many have no foundry facilities, and wrecks require much new material. It is not always that wrecked locomotives can be moved satisfactorily any distance, but if

they can these seem to embody the class of repairs that would preferably go to builders. The preparation of boiler sheets requires expensive machinery and heavy flange presses, and often railway companies have found it advantageous to buy from the builders, boilers and fireboxes to apply to their locomotives, not perhaps so much from economy as from the question of increasing the output of their shops, which would be limited by the preparation of these boilers and fireboxes. New cylinders are often purchased complete when the railway company has not had an opportunity to prepare the patterns or castings for these parts, and if machinery is scarce in the railway company's shops there is another inducement to have the parts made by the locomotive builders and kept in stock for use when needed. Such parts, for instance, as rods, cylinders, wheels and axles, valves and steam chests, driving boxes, pistons, etc., can be purchased and held ready for application, and this will keep the work under the supervision of the motive power officers much more than sending the locomotives to an outside shop, and it will also cut down the time of making the repairs and save hauling to the builders' shops, which may be quite an item in reducing the time that the locomotives must be spared from actual service on the road.

This, of course, is only a partial adaptation of the outside repair arrangement, but it should be considered in connection with our subject. Generally, however, the charges for duplicate parts are so high that it would pay the railway company to provide for their manufacture at its own shops, assuming that the funds for furnishing the machinery are obtainable, which, however, is not always the case.

When we consider the probable extension of outside repairs for locomotives, that is, outside of the railway company's own shops, it seems as if all the environments and pros and cons of the particular case under consideration must be given attention. It is very doubtful if large railways with organized shops and machinery will look favorably upon such a system as a regular procedure. Under some conditions such a railway that has not yet been able to build or complete its repair shops, with forces disorganized by a strike, or the layoffs consequent upon dull times, or by the interference which a fire is apt to make, might be compelled to take up some such procedure to tide over such an emergency as any of the above mentioned, especially if the distance be short and therefore the hauling of the locomotive to and from the shop where it would be repaired is not unduly expensive. This latter condition, however, may only exist for a comparatively small number of roads that have locomotive shops of proper size in their immediate vicinity and when we consider the lines of the Pacific coast with no locomotive shop of suitable proportions anywhere near their territory, it would be out of the question for such a solution of the repair problem to be adopted.

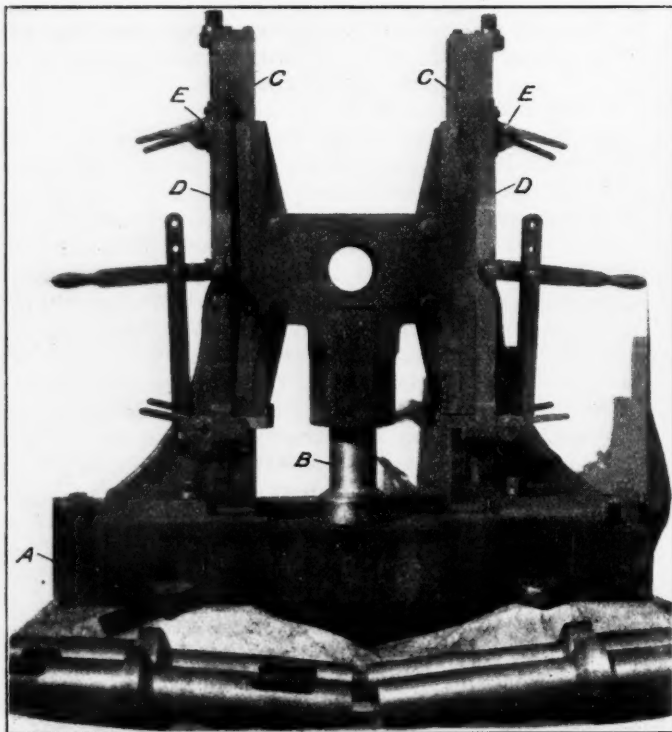
At the Chicago shops of the Chicago & North Western it is customary to make general repairs to locomotives in 13 days and only 21 days are occupied when the general repairs are accompanied by a new firebox. When we consider the time occupied in sending a locomotive to a distant builder's point and also that required to return the same after the repairs have been made, there is every inducement offered to make the total time out of service as short as possible by doing the work at the home shops. The above mentioned time of general repairs to locomotives shows what good work can be done even with an old shop building and day wages paid to labor, although it must be added that these shops are well provided with machinery and splendidly organized. The present railway situation compels economy in repairs and operation and the cutting down of all profits in lines other than those which accrue to the railway company itself seems inevitable. The desire to keep power in service the maximum of time during its existence and the standardization and keeping of repair parts in stock is able to reduce the time for

repairs greatly when properly organized, and this seems to be in favor of the railways doing repair work at their own shops.

With the increased recognition that the motive power is what earns the money and that the motive power department is one of the most vitally important branches of the service to the road as a whole, it seems likely that a more liberal policy will be pursued in the building and equipment of shops and that many roads whose facilities are now very meager may, with the improvement of the financial condition, expect a more liberal provision for their needs. We believe that modern and progressive railway officers recognize the wisdom of such a policy and already there are indications that considerable further advancement will be made on these lines, so that the need of continually sending engines away from home will be greatly reduced. Those companies which cannot or will not follow this policy will have to make the best outside arrangement possible, as new power *must* be purchased, even if the funds cannot be obtained for shop improvements.

CROSSHEAD BABBITTING MACHINE.

There is a crosshead babbitting machine in use in the shops of the Norfolk & Western by means of which the crosshead is babbitted all ready for the engine, so that no planing is needed after the metal has been poured. It consists of a heavy base *A*, in the center of which a stiff mandrel *B* is placed. The upper end of the mandrel is turned to mate in the piston fit of the crosshead, and serves to hold the crosshead firmly in place. On either side there are uprights *C*, *C*, which are planed to



Crosshead Babbitting Machine; Norfolk & Western Shops.

correspond to the guides and which slide to and fro on the base and may be clamped in any position. On each side of these there are stops *D*, *D*, which are brought up against the crosshead to prevent the molten metal from flowing out. These are clamped in place by the cams *E*, *E*, and similar cams at the bottom. The working is exceedingly simple: The crosshead is put in place on the mandrel, the guides adjusted and stops clamped in place when the metal can be poured.

The device was designed at the Roanoke shops, but duplicates have been made for other shops on the road.

DENVER, NORTHWESTERN & PACIFIC.

The following notes about the Denver, Northwestern & Pacific are taken from a paper by W. Weston, M.I.M.M., in the current issue of *The Bankers' Magazine*:

The main objects of the Denver, Northwestern & Pacific is to shorten the distance by existing lines from Denver to Salt Lake City by about 150 miles, having its course along the fortieth parallel; to make available to the people of Kansas, Nebraska, Colorado, Utah, Nevada and California, and the steamships plying between Pacific coast points and the Orient, the anthracite and bituminous coals contained in the 1,200 square miles of the undeveloped Yampa field, through the center of which the line is being built, and to give transportation facilities to a strip of country approximately 500 miles in length by 150 miles wide, hitherto devoid of any such facilities.

At the cost of upward of \$10,000,000 of his own private fortune, Mr. Moffat has already built from Denver (elevation 5,200 ft.) over the Great Divide between the waters flowing into the Atlantic and Pacific oceans, crossing the summit at an elevation of 11,660 ft. above tidewater; thence down the western slope, blasting out a roadbed for miles in the rocky sides of gorges and chasms, which are in places 2,000 ft. deep, boring fifty-five tunnels through solid granite and completing 214 miles to the coal fields and into the town of Steamboat Springs, and already gets a remunerative traffic from the country tributary to his operated line, and also from that of his projected line ahead.

About the year 1899, Mr. Moffat conceived the idea of building a direct line from Denver to Salt Lake City. His chief engineer sent out his reconnaissance parties, and his exploring mining engineer was sent over the projected line to report on the coal, mineral and other resources. The result of their work showed him an easy country after crossing the Continental Divide, and a strip of territory approximately 500 miles long by 150 wide abounding with undeveloped wealth.

Up to this time but little had been produced by this territory except hay and beef, for it was too far from the Union Pacific on the north, and the Denver & Rio Grande on the south, to raise anything but cattle, which could be driven to these railways. All else was lying dormant. So in the year 1902 work was begun.

DETAILS OF CONSTRUCTION.

In the location of the railway over the portions where it has passed from one watershed to another, and where of necessity it must lie along the sides of the mountain slopes, it was considered an important matter to avoid high trestles, which would be a continual expense, both for repairs and renewals, and the line was laid where it would have the maximum amount of roadbed in solid material; the projecting ridges were tunneled instead of adopting a too crooked alinement around them, and the effect has been to get the most substantial and permanent construction that it was possible to obtain. There are 2,885 ties per mile of track from Denver to Arrow, 76 miles of long-leaf Texas pine. From Arrow to Steamboat Springs native lodge pole pine ties were used. The rail, both on main track and sidings, weighs 80 lbs. per yard. An angle bar 29 in. long, with six bolts, is used between Denver and Sulphur Springs. Beyond that point the angle bars are 24 in. long, with four bolts. Tie plates are placed under the rails at each tie on curve and tangents on the main line and on the curved portion of each siding.

Sidings from 2,600 to 3,000 ft. long are located approximately every five miles to fit topographical conditions.

Steel plate girder bridges are located across the important streams, but owing to the difficulty of delivering steel work at the point, the minor bridges are wooden trestles, which will last ten or twelve years, when they will be replaced with steel or with concrete culverts and an embankment over the same.

LOCOMOTIVE AND PASSENGER CAR SHOPS OF THE FRISCO SYSTEM AT SPRINGFIELD, MO.

[WITH AN INSET.]

The preliminary plans of the extensive new locomotive and coach repair shops of the St. Louis & San Francisco at Springfield, Mo., showing the size and location of the principal buildings and their cross sections, were illustrated in the *Railway Age*, September 6, 1907. The plans provide for a double locomotive shop with two erecting shops, 65 ft. wide; two bays, 65 ft. wide, for heavy tools, and two bays with balcony, 40 ft. wide, for light tools.

The locomotive shop, as at present constructed, includes one set of these shops only. The building is 169 ft. 8 in. wide and 562 ft. 8 in. long inside, and has 25 locomotive pits, each 43 ft. long. The erecting shop is equipped with one 100-ton traveling crane and one 15-ton crane on the same runway. The heavy machine tool bay is covered by a 10-ton traveling crane.

chinery which was supplied by the Otis Elevator Company.

In the engine room there are two turbo generators, each 500 k.w., a.c., one 300 k.w., d.c. rotary converter, with one motor driven exciter, and one steam driven exciter; all supplied by the Westinghouse Electric Co. There is also one Laidlaw-Dunn-Gordon air compressor of 2,000 cu. ft. capacity. Provision is made for the future installation of one 1,000 and one 500 k.w. turbo generator and one additional air compressor.

LOCOMOTIVE MACHINE SHOP.

The large plan showing the location of machine tools also indicates the position of the hot blast fans for heating and the ducts which conduct the warm air throughout the building. These ducts are such a conspicuous feature of the floor plan of the machine shop that it was necessary to have them laid on in advance so that the tools could be so located that their foundations would not interfere with the underground air ducts. The three large hot blast fans are placed at proper intervals on the balcony, and the space beneath is occupied by



General View from Southeast; Springfield Shops of the Frisco System.

The boiler and tank shop has one high bay, 65 ft. wide, equipped with a 30-ton traveling crane, and one lower bay, 50-ft. span, equipped with a 10-ton traveling crane. The coach shop is built in three bays, one of them higher than the others for the truck shop, and this is equipped with a 10-ton crane with a span of 42 ft. All these traveling cranes were supplied by Pawling & Harnischfeger.

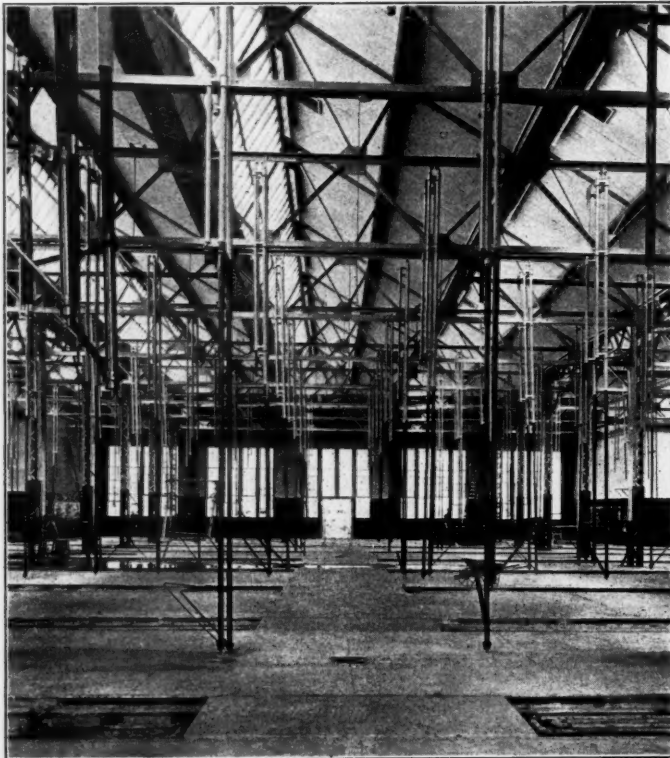
The power house is 117 ft. wide and 145 ft. long. It is divided into three bays, two of them 46 ft. 6 in. for boiler and engine room respectively, with a 20-ft. pump room between. The height from the floor to the lower side of the roof truss is 28 ft., and there is a 10-ft. basement under the whole building. The engine room is spanned by a 15-ton hand crane. The concrete stack is 10 ft., inside diameter, 217 ft. high, and was built by the Weber Chimney Co.

There are five water tube boilers of 400 h.p. each, and space is provided for three additional boilers. The boilers were supplied by The Babcock & Wilcox Company, and are fitted with chain grate stokers made by the Green Engineering Co. The boiler room is provided with overhead coal bunkers made of steel and cement, and fitted with elevating and conveying ma-

toilet rooms. These fans are driven by steam engines and have a capacity of 50,000 cu. ft. of air per minute. They were manufactured by the Green Fuel Economizer Co.

The tool room, located under the balcony at about the center of the shop, is 39 ft. x 87 ft., and room for an extension is provided directly above the second floor. All the small tools, jigs, templets, etc., have been made in advance at a cost of about \$25,000, and the shop will be completely equipped and ready for its full output in repairs as soon as it is occupied. The lavatory is also under the balcony at the extreme end of the shop and the foreman's office is above. The remaining floor space on the balcony is occupied by the air brake room, the brass room, the electrical department and the tin shop. In the heavy tool bay there is a cement floor 44 ft. x 34 ft., with an incline for drainage, and in it is the lye vat, 10 ft. x 20 ft., and a clear water vat, 10 ft. x 10 ft. These have a wall extending 18 in. above the floor level, and are large enough to immerse a complete pair of driving wheels, axle and eccentrics, which can be easily placed by the traveling crane. The smaller vat is for final cleaning after the rough dirt and grease have been removed by the lye. The wheel and axle tools for passenger

car trucks are at one end of the shop, and those for driving wheels at the other end. At the left end of the drawing, under the balcony, are shown the tools for eccentrics and pistons. To the left of the lye vats is the engine truck floor and back of the vats, under the balcony, is the rod gang, with two trolley ways overhead for chain hoists. In front of the tool room are the tools for driving boxes, to the right are the driving wheel lathes, and farther along, the tools for finishing locomotive frames and cylinders. Back of these are mis-



Interior of Coach Shop, Showing Adjustable Steel Scaffold Supports and General Shop Lighting.

cellaneous tools, lathes, planers and shapers for light work. Four turret lathes are shown, arranged in parallel lines back of the cylinders planer. For the convenience of the erecting shop there is provided a 16-in. lathe, motor driven and portable, so that it can be moved to any pit where required. There are also located at convenient intervals three double emery grinders for rough grinding and sharpening cold chisels. The great majority of the machine tools are new, and they were purchased in accordance with the list below, which also includes those for the boiler, smith and car shops. We are indebted to George A. Hancock, general superintendent of motive power of the Frisco System, and The Arnold Company, engineers and contractors, for the illustrations used herewith.

LIST OF TOOLS.

Note.—Where individual tools are mentioned by name of maker, it is understood that the individual maker's tool is to represent merely the type of tool wanted, and tools offered as substitutes are to conform to general dimensions, and perform operations equal to, and equivalent to, the tool mentioned, with equal facility.

MACHINE SHOP.

- 1 Niles 80-in. extra heavy driving wheel lathe, without quartering attachment; motor drive.
- 1 Pond 84-in. driving wheel lathe provided with sure-grip drivers, journal turning rests, without quartering attachment; motor drive.
- 1 Bement 85-in. quartering machine; motor drive.
- 1 single axle lathe, Bridgeport; motor drive.
- 1 42-in. car wheel boring machine, No. 2, Putnam Machine Co.'s patent improved; 5 steel chuck jaws; motor drive.
- 1 Putnam 100-in. hydraulic wheel press, 400-ton; motor drive.
- 1 300-ton, 50-in. Putnam hydraulic wheel press; motor drive.
- 1 Putnam, 42-in. steel tired car wheel lathe; motor drive.

Lathes.

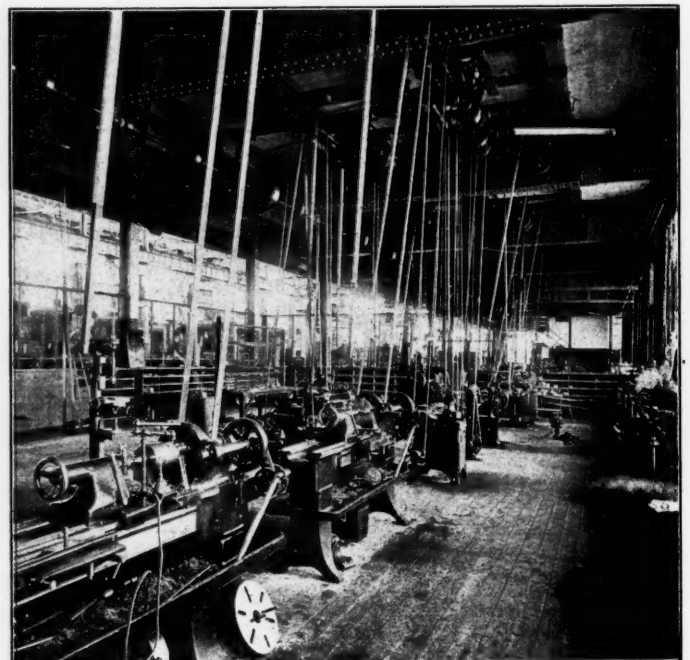
- 3 Reed 16-in. bolt lathes, 6-ft. bed; non-screw cutting.
- 4 Reed 16-in. bolt and screw cutting lathes, 6-ft. bed, back gear; taper attachment and hollow spindle.
- 4 Reed new 18-in. engine lathes, 8-ft. bed.
- 4 20-in. engine lathes, 8-ft. bed; Schumacher & Boye.
- 4 engine lathes, 24-in., 8-ft. bed; Schumacher & Boye; taper attachment and hollow spindle.
- 1 28-in., 57-in. swing gap engine lathe, 10-ft. bed, Putnam.
- 3 27-in., engine lathes, 12-ft. bed, heavy pattern, Lodge & Shipley patent head.
- 2 36-in. Pond engine lathes, 7 ft. 6 in. between centers.
- 2 36-in. Bullard rapid production vertical turret lathes, with one swivel head and one fixed head.
- 2 24-in. Springfield Machine Co.'s cabinet turret brass lathes.
- 2 20-in., 7-ft. bed, Springfield Machine Co.'s cabinet lathes.
- 1 6¼ x 26 Gisholt turret lathe equipped with standard set of tools for chuck work and standard set of tools for locomotive bar work.
- 1 21 x 3½ Gisholt turret lathe equipped with standard set of tools.

Boring Mills.

- 1 86-in. Bullard boring and turning mill with two swivel heads; motor drive.
- 1 51-in. Bullard rapid production boring mill with two swivel heads; motor drive.
- 1 42-in. Bullard rapid production boring mill with two swivel heads; motor drive.
- 1 No. 60A, 30-in. Bullard boring mill; belt drive.
- 1 Warner & Swasey cock grinder; capacity, 2-in.
- 1 Warner & Swasey 2-spindle valve milling machine equipped with cutters.

Planers.

- 1 72-in. x 72-in. Putnam planer, to plane lengths of 18 ft., 30-ft. speed, 4 heads.
- 1 42-in. x 42-in. Putnam forge planer; motor drive.
- 2 36-in. x 36-in. Putnam planers; belt driven; speed, 30 ft.
- 1 42-in. x 42-in. Putnam planer, 12 ft. bed.
- 1 crank planer 20-in. x 20-in. x 24-in., for shoe and wedge work; 30-in. stroke. Cincinnati Shaper Co.



Machine and Erecting Shop Tool Room, Showing Steel Shelving and Partitions and Steel Shafting Supports Clamped to Building Structure.

- 4 26-in. traveling headshaping machines; belt driven. Cincinnati Shaper Co.
- 1 24-in. x 24-in. x 12-ft. double horizontal milling machine. Ingersoll Milling Machine Co.; motor drive.

Slotters.

- 1 Sellers 18-in. slotting machine; motor drive.
- 1 12-in. Betts slotting machine; motor drive.
- 1 10-in. Dill slotting machine; motor drive.

Drills.

- 1 5-ft. Niles radial drill with outboard column; motor drive.
- 1 6-ft. Bickford universal radial drill; motor drive.
- 1 4½-ft. Bickford radial drill.
- 3 32-in. Aurora vertical drills; motor drive.
- 1 36-in. Foote-Burt high-duty drill.

- 2 15-in. Slate sensitive drills.
 - 2 Quint 32-in. turret, 4-spindle drills.
 - 1 horizontal boring and drilling machine, No. 3; motor drive. Lucas Machine Tool Co.
 - 1 horizontal boring and drilling machine, No. 1; belt drive. Lucas.
 - 1 1-spindle cylinder boring machine; motor drive. (Old tool from north shop.)
 - 1 Hurlbut accelerated speed cutting off and centering machine, $\frac{3}{4}$ -in. to 5-in.
 - 1 Whitney 2-spindle centering machine, $\frac{3}{4}$ -in. to 4-in.
 - 1 Whitney, 2-spindle centering machine, 5-in.
 - 1 Whitney 2-spindle centering machine, 4-in.
 - 2 Putnam nut facers.
 - 1 No. 9 Jarecki power pipe machine to thread 1-in. to 4-in.
 - 1 No. 90 Jarecki pipe machine; motor drive.
- TOOL ROOM.
- 1 Pratt & Whitney 16-in. lathe.
 - 1 Pratt & Whitney, 14-in. lathe; length of bed, 8 ft.
 - 1 15-in. pillar shaper, Hendey Machine Co.; belt drive.
 - 1 Cincinnati open-side shaper and planer.

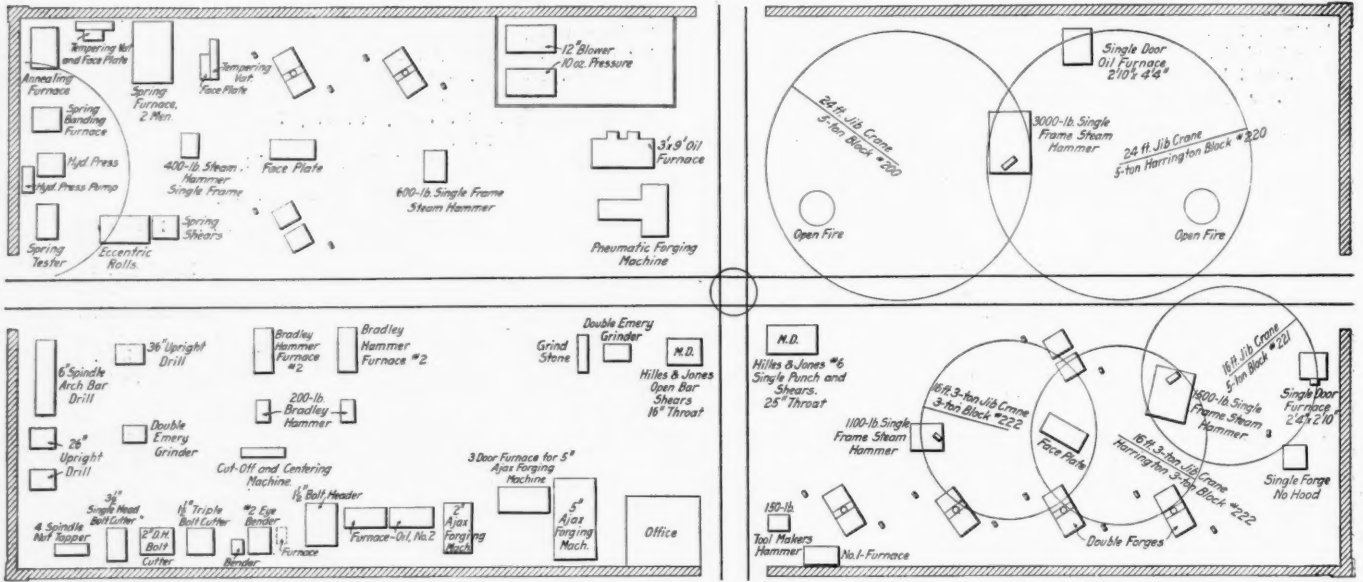
- 1 link grinder Hammett; Walschaerts links.
 - 3 tool grinders, 36-in. wheel, wet, No. 5; Safety Emery Wheel Co.
 - 2 single emery grinders, 3-in. x 26-in.
 - 2 double spindle Safety Emery Wheel Co., floor grinders, No. 1 dry wheel, 24-in. x 3 $\frac{1}{2}$ -in. face, castings, etc.
 - 3 cast-iron grindstone boxes for stone 8 in. x 60 in.
 - 3 motor-driven double emery wheel grinders, No. $\frac{1}{2}$ L Bridgeport Safety Emery Wheel Co.
 - 3 Northern motor driven grinders, pedestal type; wheels 12-in. x 2-in. face.
 - 1 No. 41 motor driven Besly spiral disk grinder
 - 1 Besly grinder with 26-in. wheel, style same as No. 12; motor drive.
- BOILER SHOP.
- 1 bending roll, motor driven, $\frac{3}{8}$ -in. plate, 3-ft. housings; Niles No. 5625-N.
 - 1 No. 34 Scully Steel & Iron Company's rotary bevel shears, to bevel up to $\frac{3}{4}$ -in. plate
 - 1 No. 2 Scully rotary splitting shears, capacity, $\frac{3}{4}$ -in. plate.
 - 1 No. 3 Hilles & Jones horizontal punch, 12-in. gap, to punch hole through 1-in. plate; motor drive



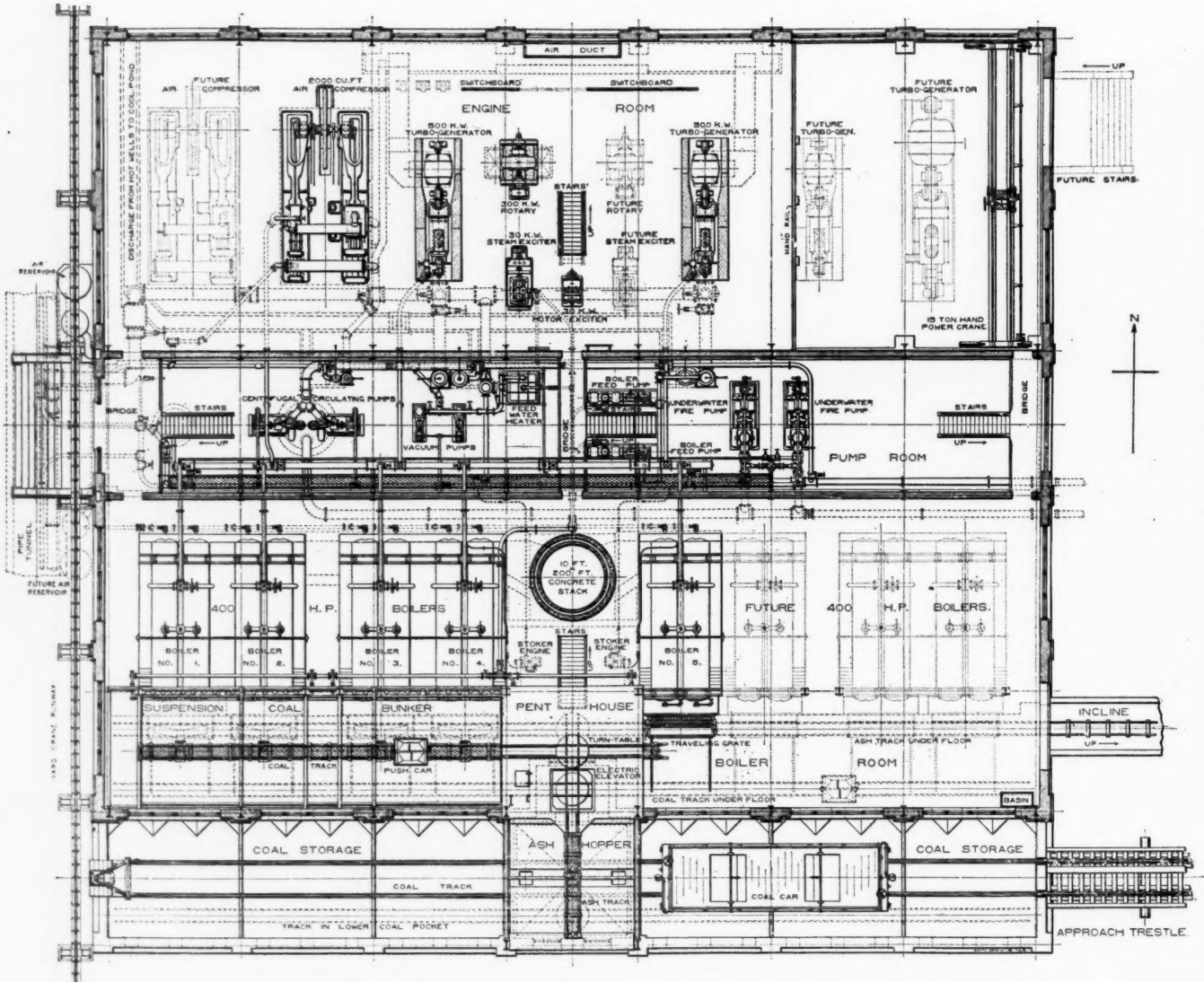
Interior of Erecting Shop. Springfield, Mo., Shops of the Frisco System.

- 1 No. 2 Pratt & Whitney hand-milling machine with vise.
- 1 Knight (St. Louis) drilling and milling machine.
- 1 20-in. vertical drill, back-gear wheel, lever and automatic feed; Rockford Machine Co.
- 1 No. 2 universal milling machine with vertical attachment. Hendey Machine Co.
- 1 No. 4 Safety Emery Wheel Co.'s tool grinder with 24-in. wheel.
- 1 No. 2 automatic tool room grinder; Walker Grinder Co., Worcester, Mass.
- 1 No. 1 Sellers' universal tool grinder, for lathe and planer tools.
- 1 No. 3 universal grinding machine, 12 x 40 Landers Machine Tool Co. (automatic cross-feed); reamers and general tool-room use.
- 1 Modern Tool Company's die grinder for bolt dies.
- 1 No. 4 Besly spiral disk grinder.
- 1 Yankee twist drill grinder, Style P.
- 2 Pedrick & Smith pipe-bending machines.
- 1 30-in. x 36-in. power forging press; Lucas.
- 1 Greenard arbor press, No. 4
- 1 hydraulic forcing press, capacity, 100 tons; pump motor drive. Chambersburg Engineering Co.
- 2 rotary valve seat planers, 26-in., H. B. Underwood.
- 1 link grinder, H. G. Hammett, Troy, N. Y.

- 1 No. 1, Hilles & Jones single punch, 30-in. throat, $\frac{3}{4}$ -in. hole in $\frac{5}{8}$ -in. plate.
- 1 Hilles & Jones rapid action punch, 12-in. throat for punching tank angles and braces, $\frac{1}{2}$ -in. hole through $\frac{1}{2}$ -in. plate.
- 1 Mann-McCann fine cleaning machine; "Frisco" build.
- 2 Hartz flue welders.
- 2 tube cutting machines for cutting to length; "Frisco" build.
- 2 Ferguson flue welding furnaces; Railway Materials Co.
- 4 pressure fans.
- 1 exhauster.
- 8 furnaces; Railway Materials Co.
- 1 Bickford 66-in. plain radial drill with large box table, suitable for drilling flue sheets and general boiler work; provided with low jib crane and Yale & Towne duplex chain hoist.
- 1 Aurora 32-in. vertical drill.
- 1 No. 72 single emery wheel grinder, 3-in. x 26-in. wheel; Safety Emery Wheel Co.
- 1 grindstone with truing device, 60-in. x 8-in. pattern, Pond No. 495-P.
- 1 Helwig pneumatic staybolt nipper; capacity, 1 $\frac{1}{4}$ -in. bolt.
- 1 pneumatic staybolt breaker; "Frisco" make.
- 1 flanging clamp; air operated; "Frisco" make.



General Layout of Forge Shop.



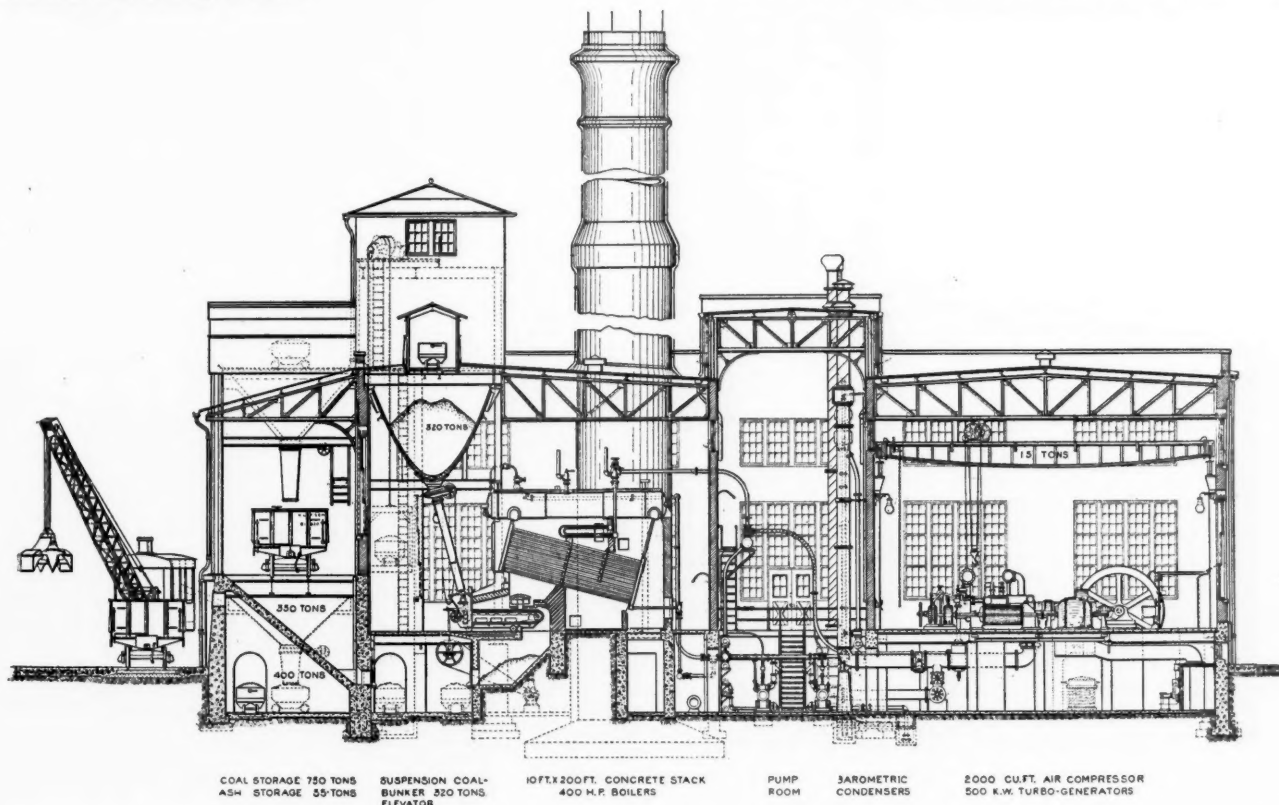
Floor Plan of Power House. Springfield, Mo., Shops of the Frisco System.

- 1 Ferguson's large plate annealing furnace.
 - 1 Ryerson & Son pneumatic forge for rivets.
 - 3 Ryerson & Son ball-bearing portable rivet forges.
 - 1 hydraulic test pump; Ashcroft.
 - 1 12-ft. binding rolls from South shop.
 - 1 54-in. single punch from North shop.
 - 1 splitting shears from North shop.
- BLACKSMITH SHOP.
- 1 large hammer, single frame; Chambersburg Engineering Co.
 - 1 3,000-lb. steam hammer.
 - 1 1,500-lb. steam hammer.
 - 1 1,100-lb. steam hammer.
 - 1 600-lb. steam hammer.
 - 1 150-lb. tool maker's special self-contained steam hammer; Chambersburg.
 - 1 Bradley hammer, 200 lbs.
 - 1 Hilles & Jones No. 6, 25-in. throat, single punch and shear with standard punching and 45 deg. shearing attachment; capacity, 10 x 2; motor drive.
 - 1 Hilles & Jones open-bar shear, 16-in. throat, shear blades for flat; capacity, 10 x 2; motor drive.
 - 1 Coulter & McKenzie combined shear and punch with nibber attachment, to shear 5-in. spring steel.
 - 1 2-in. Ajax forging machine.
 - 1 1½-in. National bolt heading machine.
 - 1 No. 2 Williams-White eye-bender.
 - 1 Pennock iron-bending machine.

- 1 hollow chisel mortiser, No. 2-C. Greenlee.
- 1 Invincible double surfacer, No. 177, 30-in. wide. Berlin Machine Works.
- 1 No. 181 four-side molder. J. A. Fay & Egan Co.
- 1 upright molding and shaping machine, No. 203. Berlin Machine Works.
- 1 No. 58 special band saw. J. A. Fay & Egan Co.
- 1 heavy Universal saw bench. Greenlee.
- 1 Patternmaker's lathe, 30-in. swing. J. A. Fay & Egan Co.
- 1 Besly spiral disk grinder, No. 1-F.
- 1 Jarecki No. 6 pipe machine, ¼-in. to 2-in.
- 1 No. 1 grinder. Wheels, 24-in. x 3½-in.; motor drive. Safety Emery Wheel Co.
- 1 grindstone, 8-in. x 60-in.
- 1 No. 12 Greenlee automatic hollow chisel mortiser with No. 7-C boring attachment.

SHOP NOTES FROM THE RUTLAND.*

It is less than a year since repairing frames in the smith shop became an established practice on the Rutland Railroad; power bought in 1902 is now coming in for new fireboxes, and about all of this class have one broken frame and most of them two, that have been repaired by patching and with the oil weld, and, in two cases, with the Thermit process. The oil



Vertical Section of Power House. Springfield, Mo., Shops of the Frisco System.

- 1 3½-in. National single-head bolt cutter.
 - 1 2-in. National double-bolt cutter.
 - 1 pneumatic forging machine from South shop.
 - 1 National 4-spindle geared nut tapper.
 - 2 No. 1 Safety Emery Wheel Co.'s 2-wheel grinder; motor drive.
 - 1 grindstone, 8-in. x 60-in., with truing device; Pond No. 495-P.
 - 1 36-in. Aurora plain upright drill.
 - 2 25-in. Aurora upright drills.
- CAR SHOP
- 1 combined universal wood-worker, No. 3. J. A. Fay & Egan Co.
 - 1 Patent universal wood-worker, No. 2½. J. A. Fay & Egan Co.
 - 1 improved frets scroll saw No. 6. J. A. Fay & Egan Co.
 - 1 band scroll saw No. 58. J. A. Fay & Egan Co.
 - 1 vertical cut-off saw and gaining machine, No. 6, 40-in. saw; Greenlee.
 - 1 automatic vertical cut-off saw. J. A. Fay & Egan Co.
 - 1 patent tenoning machine, No. 12. J. A. Fay & Egan Co.
 - 1 foot-power miterer, No. 102. J. A. Fay & Egan Co.
 - 1 automatic knife grinder machine, No. 2. J. A. Fay & Egan Co.
 - 1 heavy Universal saw bench, triple arbor. Greenlee Bros.
 - 1 standard heavy horizontal hollow chisel mortiser and chisels. Greenlee.

welds and patches we expect to cut out of all of them as they come; the Thermit we shall have to hold a council on, as some of us think that a frame repaired by this process is somewhat of an invalid still, unless the point of repairs is brought up to a welding heat inside the mold before the Thermit is poured, and we do not think our frames were hot enough when we tapped the crucible and let the Thermit in. Consequently, there is no fusion between the two metals, excepting, perhaps, a spot just where the Thermit first struck the frame. However, we are in the business of "frame repairing" to stay, and as such is the case, we have looked the field over pretty closely for points, and have listened to some good arguments made before our different conventions, and I must admit that we have learned a great deal therefrom; but instead of using the regulation "V" weld in making repairs

*From a paper by J. E. Carrigan, Foreman Blacksmith, Rutland Railroad, presented at the International Railroad Master Blacksmiths' Convention.

we have gone one better and adopted the plan of using one "V" and two binders, being particular to select the best stock at hand for "V" and binders, and to have the grain run in the same direction with that of the section to be repaired. We are obliged to do this work with sledges, not having any steam hammer, and we contend that it is the best and strongest weld possible to be done with sledges, and think that even a man with a steam hammer might consider it profitable to himself and his company.

I wish to add a few words in description of the tools we use in handling our frames. We use an adjustable equalizer, suspended from a quick acting chain-falls, which allows us to raise or lower it easily; the equalizer is made 1½ in. x 8 in. x 14 in. long. We have no trouble in striking a balance on the length of any frame with an equalizer made in this way. The frame wheels are 36 in. in diameter on the bearings, and it is an easy matter to get a balance crossways of the frame by placing the heavy section of frame nearest the center of wheel. With a wheel of this size there is no need of using scrap iron for counterbalance, and it will take in and you can turn over the lightest or heaviest frames you have with very little trouble.

Almost everyone has had trouble sometime or another getting a frame into the fire to suit; there are times that it doesn't lay right, or something is in the way. Now, we have a frame fire in the Rutland shop that I can recommend to anyone wanting the handiest thing possible in that respect, and that is a "portable forge," connected to air pipe with a hose or to the compressed air pipe. You can set it anywhere, on either side of your hammer, or at the most convenient point to suit the frame and hammer, and when you come to do work with sledges on a block, in a small shop, it is perfection. When the job is done, all you have to do is disconnect it and truck it out of the way and leave it there until your next frame comes along.

NOTES FROM THE ST. PAUL SHOPS OF THE GREAT NORTHERN.

A multiple staybolt drill in use at the Dale street, St. Paul, shops of the Great Northern is shown in the accompanying illustrations, Figs. 1, 2 and 3. It was designed and built at these shops and is, so far as we know, the most elaborate device of the sort in use in any shop in the country. It has a total of 11 drills—three on each side and on top, and two at the back—and is run by four men. One of the side drills was removed at the time the photograph was taken. The saving in time possible with this number of drills and men, all working together, is obvious, the staybolts in a boiler now being drilled out in one-fourth of the time possible by any method previously used in these shops.

As appears from the illustrations, the frame is formed of 5-in. pipe columns and 8-in. double channel transverse top members, with latticed diagonal braces. The frame is 13 ft. 2½ in. x 15 ft. 9 in. on column centers, and the pipe columns are 16 ft. 4½ in. long. The top set of drills is carried on a rail, supported by a double-channel frame, the side members of which are secured to heads surrounding and sliding vertically on the main frame columns. This drill frame is raised and lowered by means of four power-driven screws mounted on the frame columns and about half the length of the same. The side and end drill carriages or rails are mounted on vertical guide bars, 2½ in. x 7 in., upon which they slide, being moved by a power-driven worm mechanism, as indicated in the carriage details, Fig. 3. The side guide bars are adjustable laterally, for different widths of fireboxes, by top and bottom adjusting screws from a hand-wheel on the latter, a vertical shaft inside the column, and bevel gearing, imparting the motion to the top screw. At the top the guide bar travels between the two frame channels and is carried on four small wheels, a pair rolling on each channel.

Details of the drill carriage are included in the drawings. As will be seen from these and the photograph, the drills are driven from a horizontal shaft under the carriage, this shaft also serving to hinge the stock to the head. The horizontal shaft is driven by bevel gearing from a vertical shaft at one end. The drill stock is adjusted to drill at different angles by a centering screw between head and stock, plainly seen in the photograph. The drill is fed by air pressure, the hose connections to the small 4-in. x 4-in. air cylinder on the back of each drill stock being for this purpose. Power for the machine is furnished by a 10 h.p., a.c. motor, running at 865 r.p.m. loaded.

The machine for cutting out boiler flues, shown in Fig. 4, was invented by John T. Fuhrmann, foreman of the tool room. As seen from the cross-sectional views, there are three ½-in. circular cutters, which are forced out to the cutting position by a three-sided, tapered spindle, actuated by the pneumatic cylinder above. The cutters are held to their normal position by a coil spring at each end, shown in the longitudinal section

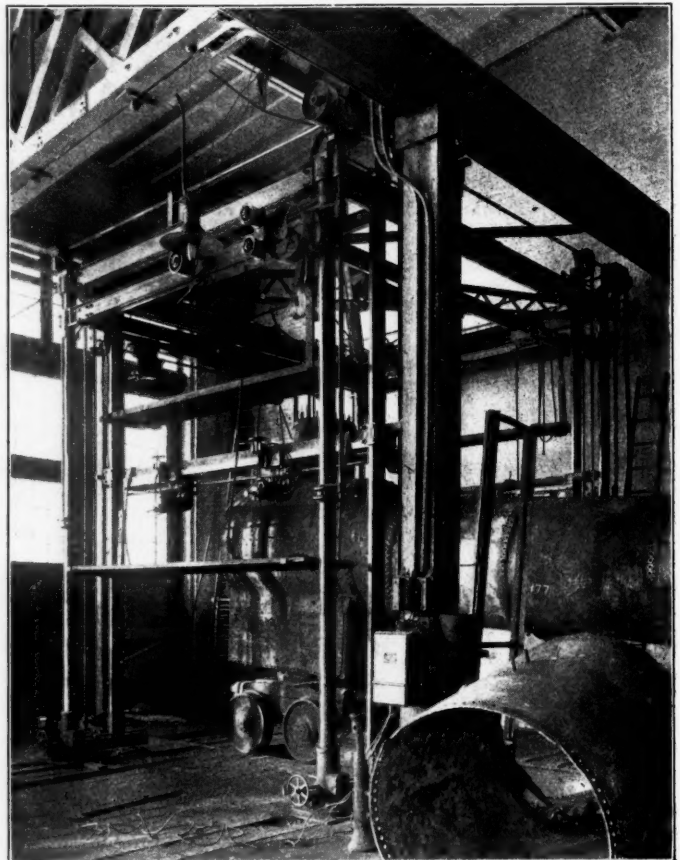


Fig. 1—Multiple Staybolt Drill.

and the cross-section on B. The cutter is driven by an end-spindle air motor, also the invention of Mr. Fuhrmann. These motors have been in use on the Great Northern for a long time, there being about 190 in service at the present time. They are designed for close-quarter work and are, therefore, especially adapted for use with this flue cutter, enabling the flues to be cut out at both ends without trouble. The device is easily handled by one man, motor and cutter together weighing only 36 lbs. It will cut as high as 18 flues a minute, and do it smoothly, without burring the ends, leaving them in shape for welding. A set of cutters has a life of more than 3,000 cuts. The device has been in use in the Great Northern shops for more than a year. The inventor has applied for a patent on it.

Driving box brasses are turned on a center-drive axle lathe, using the turning bar shown in Fig. 5. Two brasses can be turned in a half hour, or 15 minutes to the brass. The bar, which is 5 ft. 8 in. long, is made from scrap axle. Details of

the driving dog and the steady and grip flanges are given.

The grip flanges are made in different diameters to suit brasses of the corresponding size, the diameter of the grip flange being that of the finished brass. These flanges are a sliding fit on the bar. The steady-flange fits in the center head of the lathe to steady the bar. These turning bars are being used in all of the shops of the road. This same kind of lathe is also used for driving axles, saving much time.

These mandrels are in a rack beside the boring mill and one man gives all of his time to boring and fitting driving boxes. The Great Northern uses grease for its driver journals, and the grease grooves, which are $\frac{3}{8}$ in. x $\frac{3}{8}$ in., are cut in the brasses by this man with an air hammer.

The driving boxes are babbitted in shallow cast-iron pans. The box is inverted in the pan and the latter, which is the proper depth for the desired thickness of the babbitt, is filled

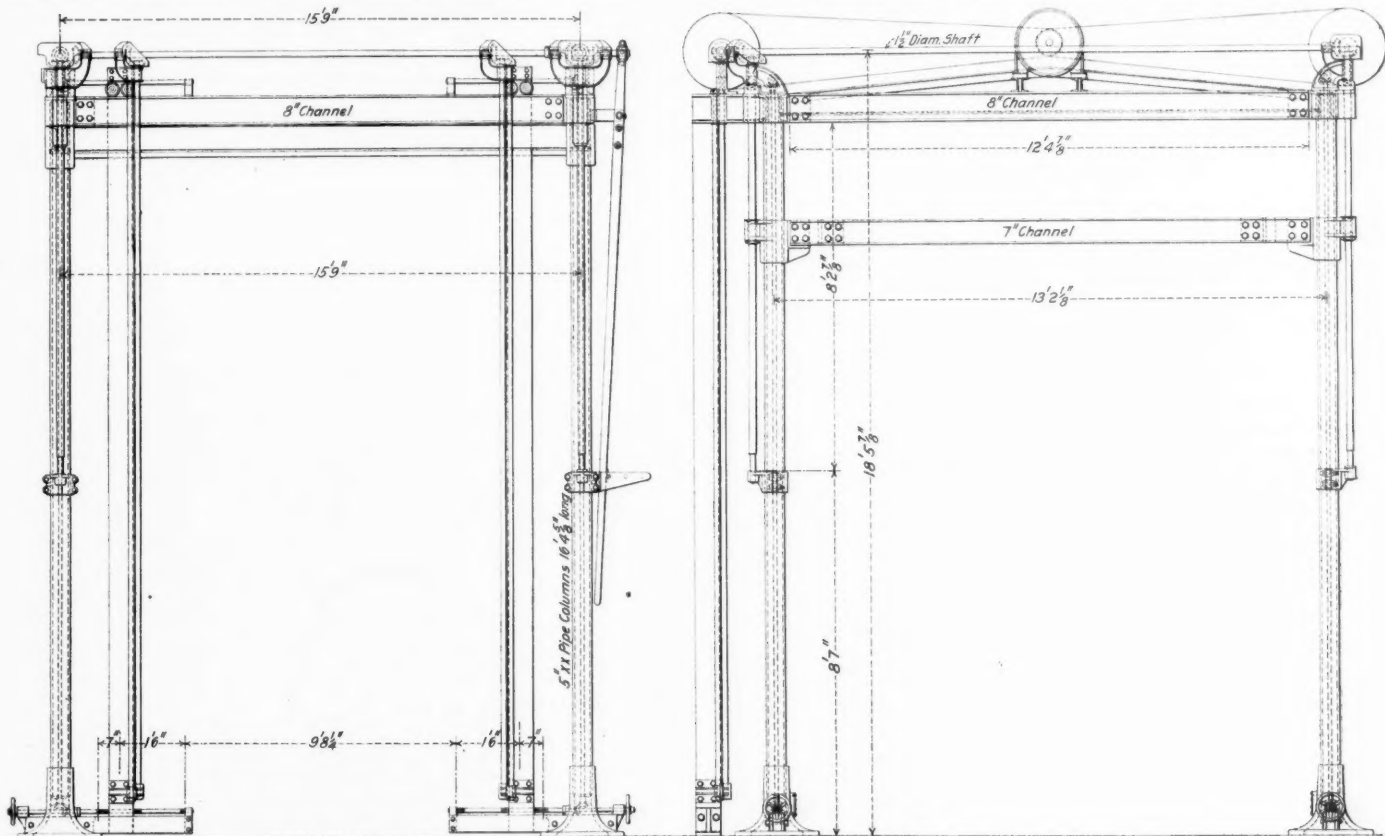


Fig. 2—Side and End Elevation of Multiple Staybolt Drill; Great Northern Shops.

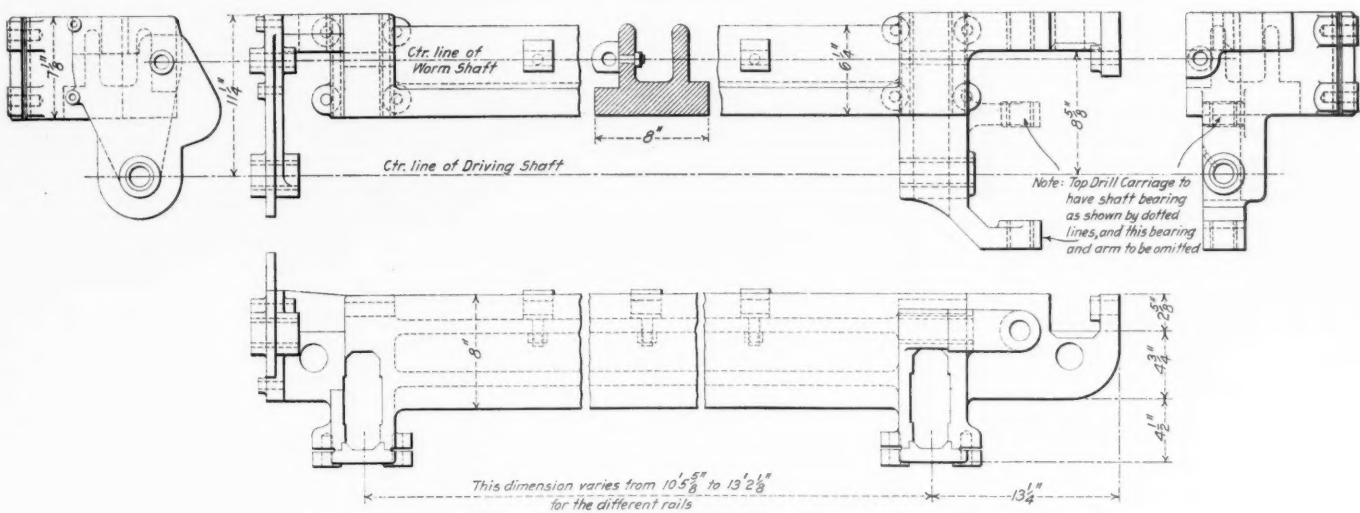


Fig. 3—Drill Head and Carriage Details of Multiple Staybolt Drill.

Driving wheel tires sent to these shops from outlying points are turned on a lathe instead of a boring mill by using mandrels made of a scrap axle and two scrap centers. The latter have, on their peripheries, grooves for wedges, spaced 10 in. apart, the openings being 1 in. x $\frac{5}{8}$ in., tapered $\frac{1}{8}$ in. There are five sets of these mandrels for different diameters of tires.

All driving boxes are fitted to mandrels, instead of boring them and sending them to the machine side to be fitted to the journal. These mandrels are cast-iron cylinders ranging from $7 \frac{9}{64}$ in. to $9 \frac{1}{2}$ in. in diameter, increasing by sixty-fourths.

with the metal. It is said to save 75 per cent. in time over the putty-and-sheet-iron method.

This shop is now using brass shoes and wedges. They are milled out, 10 being done at one operation. Instead of planing the sides they are ground on a side grinder.

One man does all of the laying out for the shops and is in charge of all blueprints, jigs and templets. All blueprints and templets are kept in drawers, except frame templets, which are kept in a bin. Jigs are kept in pockets under the drawers. Everything is classified and numbered for easy selection, and

on the outside of each case or bin is a list of the contents with the numbers.

An 18-in. portable drill press is used on the erecting side for engine trimmings, shoes and wedges, etc., to save taking them across to the machine side. It is mounted on a wagon and is driven by a 2-h.p. induction motor. There is also a portable cylinder boring outfit consisting of a 3-h.p. induction motor on a wagon, belted to an old-style boring bar. Motor-extension receptacles for these portables are placed at every other pit, drawings of a receptacle and plug being reproduced herewith in Fig. 6. They were designed by G. Willius, Jr., while mechanical engineer of the Great Northern.

The device is designed to be used either with a two or three-wire circuit; to prevent a reversal of polarity by im-

grease forms are made of two kinds, one being of a size to fill the cellar and the other being shimming or filling pieces 1 in. thick to slip into the bottom of the cellar as the grease above is used up. This saves dropping the cellar and filling the casing, and can go on indefinitely, until the engine comes in for repairs. The grease press consists of a 16-in. air cylinder with a 54-in. stroke, bolted to a 12-in. grease cylinder of equal stroke. On the end of the latter is a nozzle 18 in. long, with four different sizes of tips for the corresponding sizes of grease cellars. The cylinders lie on their sides, the filling hole for the grease chamber being at the rear end, on top. The grease is pressed out on to a board having nailed to the back side a strip with six equidistant slots, or saw kerfs, in it. The grease cutter is an old hand saw with the teeth ground off and

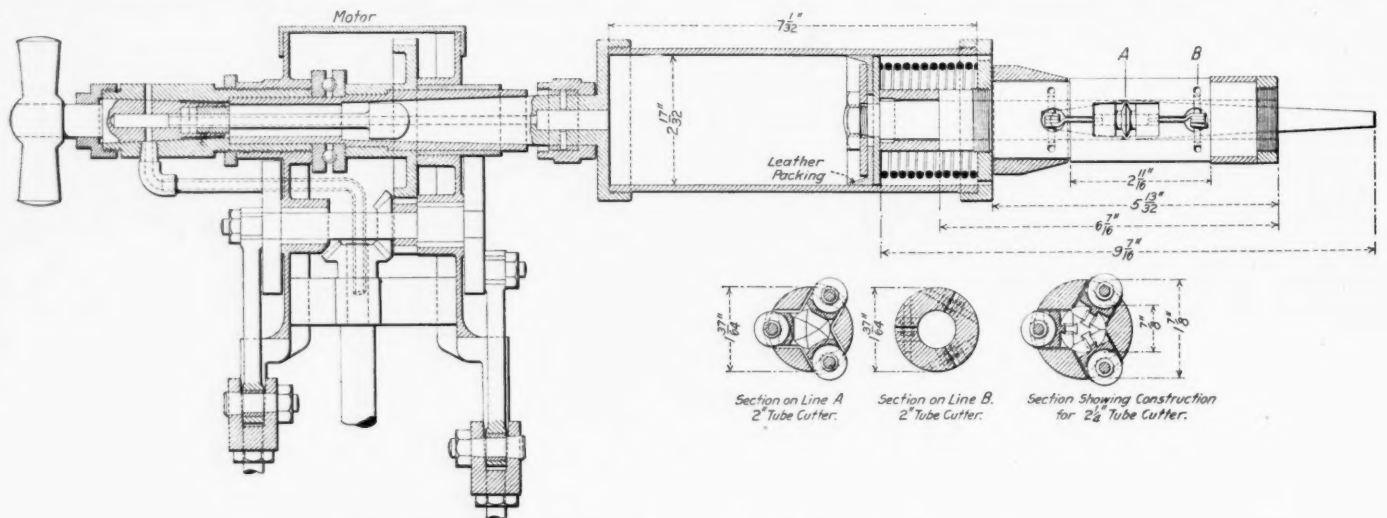


Fig. 4—Pneumatic Flue Cutter; Great Northern Shops.

proper use of the plug, and to guard against short-circuiting. It is adapted for either indoor or outdoor use. The socket or receptacle has three spring blades arranged in triangular form, as shown by the end view, mounted on a block of slate secured to a metal base. Each blade is crimped about a third of the way from the outer end to fit into corresponding grooves in the plug in order to retain it, and the lower blade has an additional bend at its inner end to serve as a stop for the plug. The triangle is made irregular so that the plug can be inserted in only one way. The plug is made adjustable, as to contact, by having the fiber block at its upper end movable, to give any desired degree of bow to the blades. The receptacle is enclosed in a planished iron case lined with asbestos, arranged to be easily removed. The socket blades project through a triangular opening in the lower end plate, and have their ends bent outwardly to facilitate entrance of the plug. The device can be used on a.c. or d.c. circuits, up to 600 volts.

Reference has been made to the use of driving box grease. Elvin cellars are used, and instead of pounding the grease into the cellar by hand, a molding machine has been devised. The

edge sharpened. The nozzle for the filling pieces is 16 in. long and there is only one size of tip. The large forms are put in tin casings and packed in boxes for shipment. The fillers are laid flat in boxes with paper between the layers.

There is also a former for rod-cup grease, on the same principle, with different-sized nozzles. The grease is cut to 22-in. lengths and put in holders made of old boiler tubes, 24 in. long, with a wooden plug in each end. The engineman keeps one of these in his seat box.

A simple and successful grinder for facing off pedestal jaws over the erecting pit is shown in Fig. 7. It is motor driven,

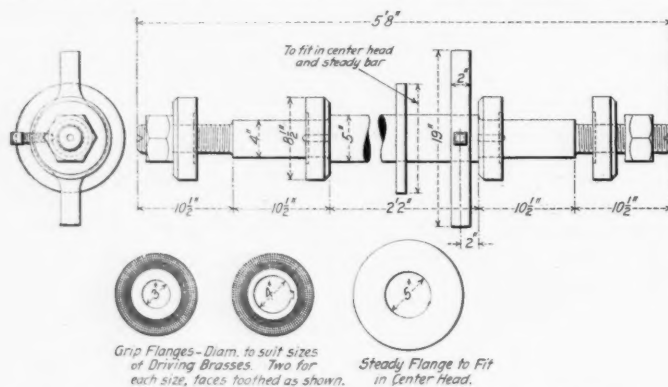


Fig. 5—Turning Bar for Locomotive Driving Brasses.

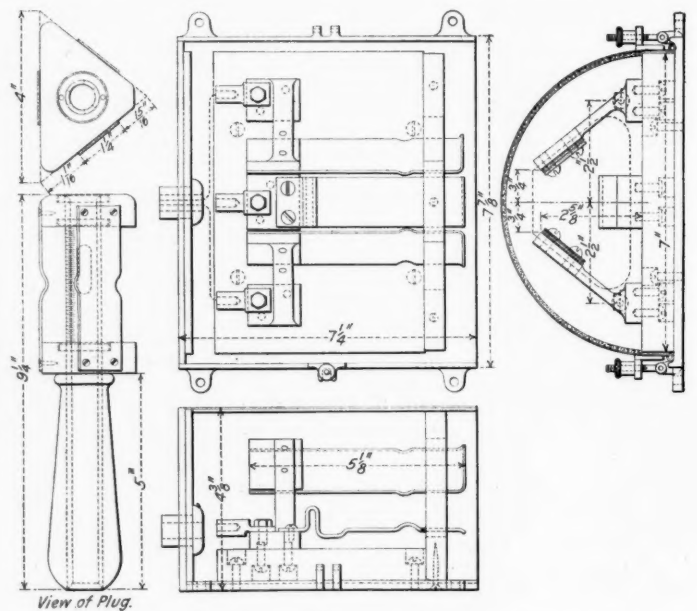


Fig. 6—Motor Extension Receptacle and Plug.

the motor being under cover on the hand truck in the foreground. The device has an angle-bracket which is held to the locomotive frame by two clamps. The grinder frame is bolted to this bracket and is adjustable sideways for grinding the vertical and sloping legs. A crosshead moves verti-

being toothed to form a rack. The emery wheel is an 8-in. cup type, and is swung around in a half circle back of the frame to grind the other leg. It is held in position by dowel pins. The knuckle-joint pulley-and-belt frame has arms 2 ft. 8 in. on centers and revolves around the motor shaft. The grinder can thus be swung over to a second jaw without changing the position of the motor. The latter runs at 900 r.p.m. and the wheel at 1,200. It is also proposed to use the device for light truing of slide valve seats.

We are indebted to J. C. Heron, Superintendent of Shops, for courtesies in connection with securing these notes.

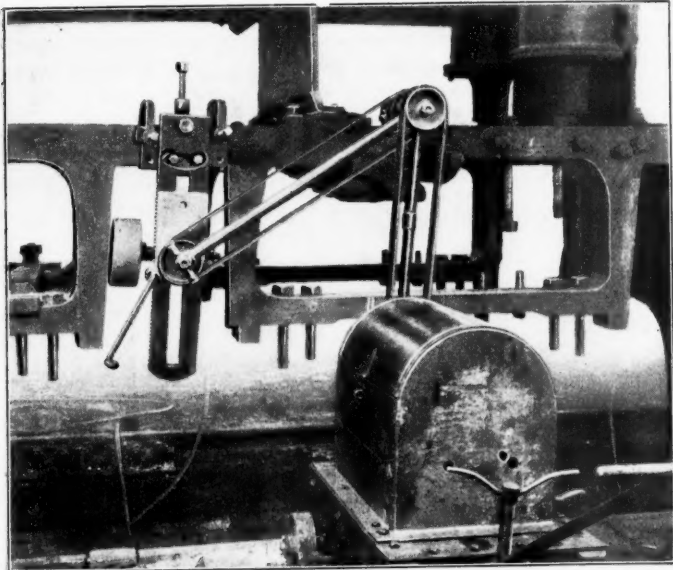


Fig. 7—Pedestal Jaw Grinder.

cally in a slot in the frame, and the emery wheel is driven by bevel gearing on the rear side of the crosshead. The crosshead and wheel are moved up and down by the hand crank below the wheel, the adjacent edge of the grinder frame

TRAIN RESISTANCE.

BY F. J. COLE,
Consulting Engineer, American Locomotive Co.

II.

JOURNAL FRICTION.

If we admit that Mr. Carus-Wilson's statement: "Under the conditions of ordinary railway practice, journal friction is independent, both of speed and load and may be taken to be a constant quantity depending only on the wheel and journal diameters," is correct, it is necessary to seek elsewhere than journal friction for the causes which increase the resistance per ton for empty cars more than when they are loaded. His deductions are based on the experiments made by Mr. Tower for loads and speed and from W. Stroudley for loads at constant velocity. Mr. Carus-Wilson accounts for this increase in resistance by flange action. The static weight of the trucks alone without the weight of body or load is taken as the base of the energy required for flange action. So that whether loaded or light the force is constant for any one car, the total weight of the car being used as a divisor, therefore the light or empty car must offer the greatest resistance per ton.

It is probable, however, that part of the increased resistance of empty cars is due to journal friction. Tests made by other investigators are cited to support this assumption. The journal pressures based on actual net bearing surface, in American railway practice, have a range of approximately from 150 to 450 lbs. per square inch, the former being the pressures for empty cars and the latter for those fully loaded. Bearing pressures based on projected area (journal diameter x length) range from 110 to 325 lbs. per inch for empty and loaded cars respectively.

Quoting from a well-known authority: "For general purposes and for heavy work, the value of co-efficient varies nearly inversely as the square root of the pressure, for pressures from 50 to 500 lbs. per square inch. The co-efficient for rest or starting varies nearly as the cube root of the pressure. The resistance due to friction varies with velocity, decreasing with increasing velocity, rapidly at very low speeds as from 1 to 10 ft. per second, and slowly as higher speeds are reached."

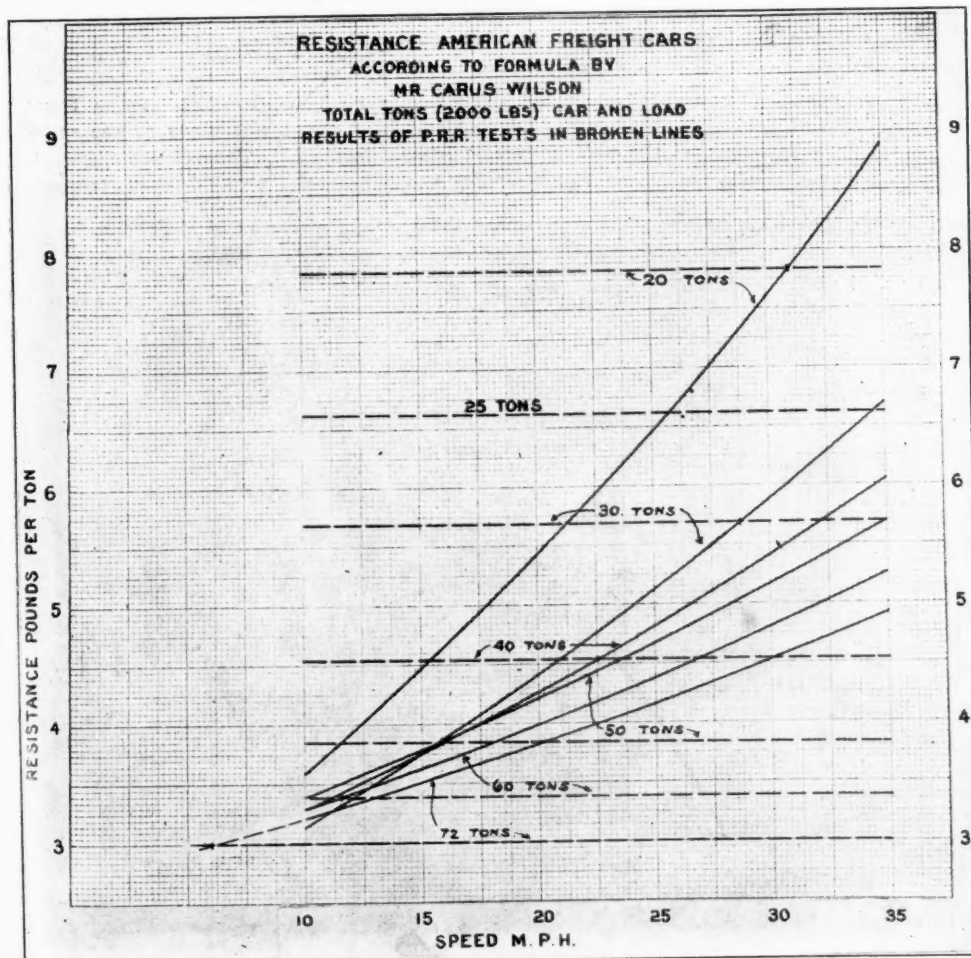


Fig. 3.

(Thurston—"Friction and Lost Work," pages 340 to 341.)

On the above basis the journal friction relatively of loaded 50-ton capacity cars which weigh 72 tons loaded and 22 tons light, is:

2.56 per ton loaded. 4.63 per ton empty.

Co-efficient of friction taken as .0077. 33-in. wheels, 5½-in. x 10-in. journals. If weight of wheels and axles is deducted:
2.56 per ton loaded. 4.99 per ton empty.

In the graphical results of the experiments made on the testing machine of James Hopps, published in *Engineering*, November 2, 1906, a uniform decrease of co-efficient of friction with increase of pressure is shown between the limits used on railways. This is characteristic of all these experiments. The question of decreases of friction co-efficient with increase of pressure within the limits of railway practice, is largely one of lubrication. With good lubrication the decrease is clearly shown by several authorities.

Wellington's tests of different loads and velocities of range from 0 to 12 miles an hour, show the decreasing co-efficient of friction with increase of velocity. (Trans. Amer., Sec. C. E., 1884.)

The following test also is quoted. The investigation was made by a large railway but the name was withheld at the time of publication:

Test for Journal Friction, the Basis Being 100 Revolutions per Minute.
4 in. x 8 in. journals, 33-in. wheels.

Temperature deg. F. journal:	Revolutions per minute			
	100	200	300	600
Maximum start.....	81 = 100%	92	99	88
Average	100	108	121	147
Minimum stop.....	106	110	123	144
Journal friction:				
Maximum start.....	191 = 100%	110	130	163
10 minutes after.....	138 = 100%	99	82	79
Average	100	95	84	69
Minimum stop.....	86 = 100%	94	82	73
Dynamometer, h.p.:				
Maximum start.....	?	?	?	?
10 minutes after.....	138 = 100%	197	246	474
Average	100	190	251	413
Minimum stop.....	86 = 100%	189	246	436

NOTE.—The maximum starting friction (the maximum speed being quickly reached), is not very accurate, but is higher the higher the speed, when the journal is at the same temperature. In each case the reduction is very rapid, but for some time after starting the friction reading is very unsteady. The figures given for 10 minutes after the start are likewise not as reliable as for the average and at stop. The temperature of the journal at starting depended on the temperature of the room, and preferably should have been the same for all tests. Note that while the friction decreases as the speed increases, the increase in

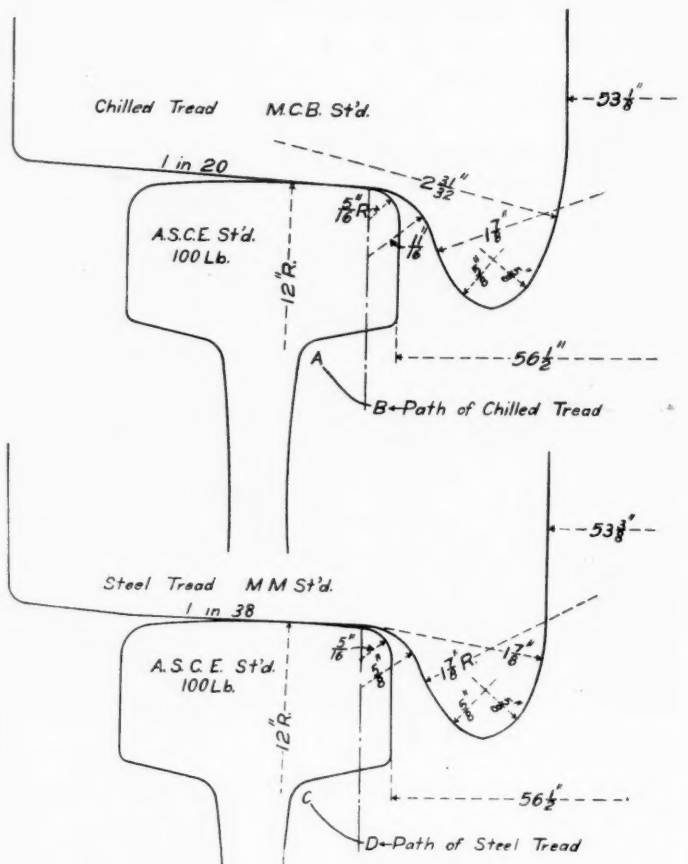


Fig. 4.

temperature with increase in speed, is accompanied by an increase in power required as the speed increases.—("Resistance of Empty and Loaded Coal Cars," the *Railroad Gazette*, April 14, 1899, page 262.)

"When the matter of locomotive loading on the tonnage basis was first considered, an effort was made to use some of the well known resistance formulas. The results obtained by using these formulas could not be verified by dynamometer

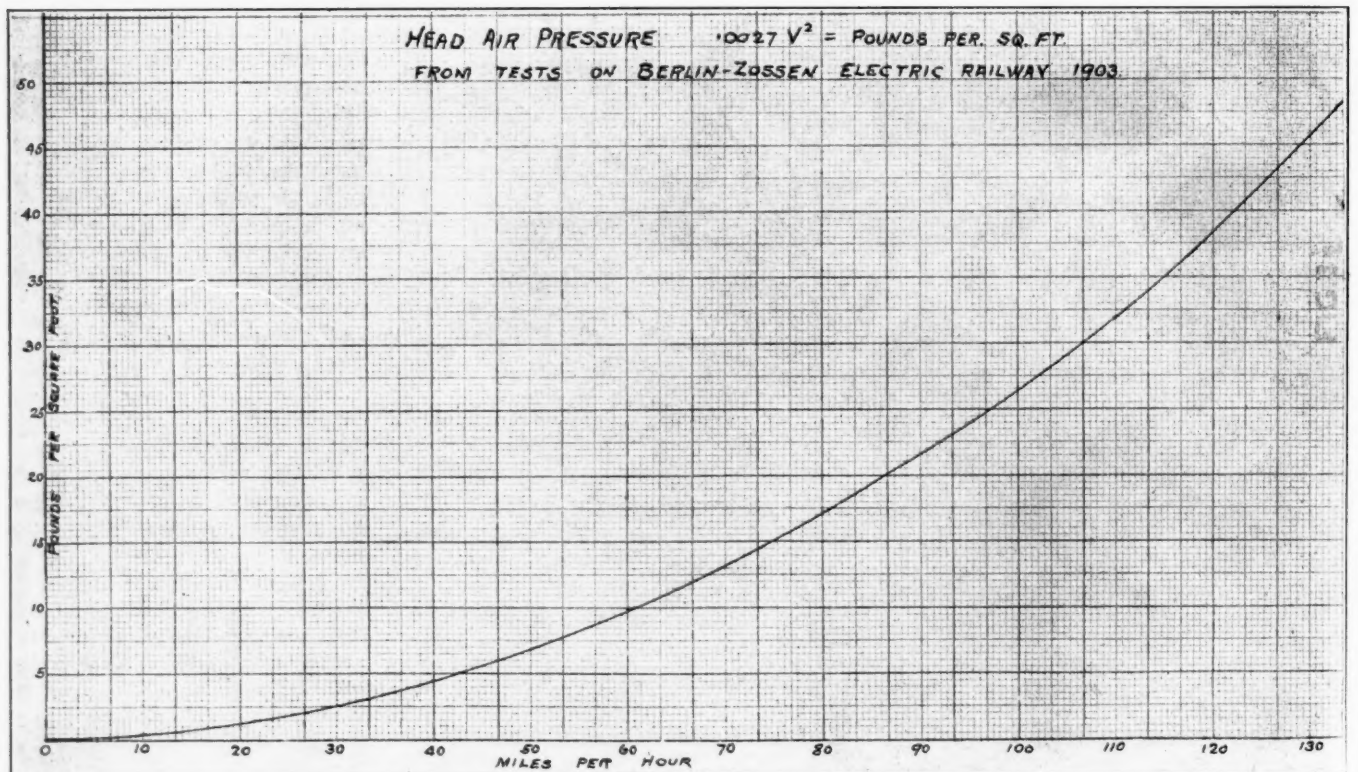


Fig. 3 1-2.

tests, as the records indicated that the rolling and journal friction remained practically constant at ordinary freight train speeds. This led to an investigation of the relation of the drawbar pull developed by the locomotive to speed."

(Adjusted Tonnage Rating, D. F. Crawford, Proceedings Western Railway Club, December 17, 1901.)

J. A. F. Aspinall quotes in his paper on train resistance, the experiments on journal friction made by Beauchamp Tower, stating that above a certain velocity the co-efficient of friction increases slightly with some power of the speed. From the conditions agreeing most closely with the rolling stock experimented upon, he has compiled the following table:

Speed		Co-efficient of friction.	Axle-friction, lbs. per ton.
Of axle, ft. per min.	Of train, miles per hr.		
157	20.0	0.01	1.65
209	26.6	0.0087	1.43
262	33.4	0.0085	1.4
314	40.0	0.0078	1.29
366	46.6	0.0085	1.4
419	53.3	0.01	1.65

"Pad lubrication has been taken, as it seems to correspond

buffer screw couplings but automatic Janney couplings, thus sparing the fingers and lives of the native Africans who couple the cars.

UNIFORM CLASSIFICATION.

BY SAMUEL O. DUNN,

Western Editorial Manager of the *Railroad Age Gazette*.

I.—HISTORICAL.

A committee composed of representatives of the three interstate freight classification committees of the railways of the United States has been at work in Chicago during the past year trying to frame a freight classification which shall be uniform in rules, descriptions of articles and minimum carload weights. It is hoped by the railways that if they apply such a classification universally on interstate traffic its universal application to intrastate traffic also may be secured. The

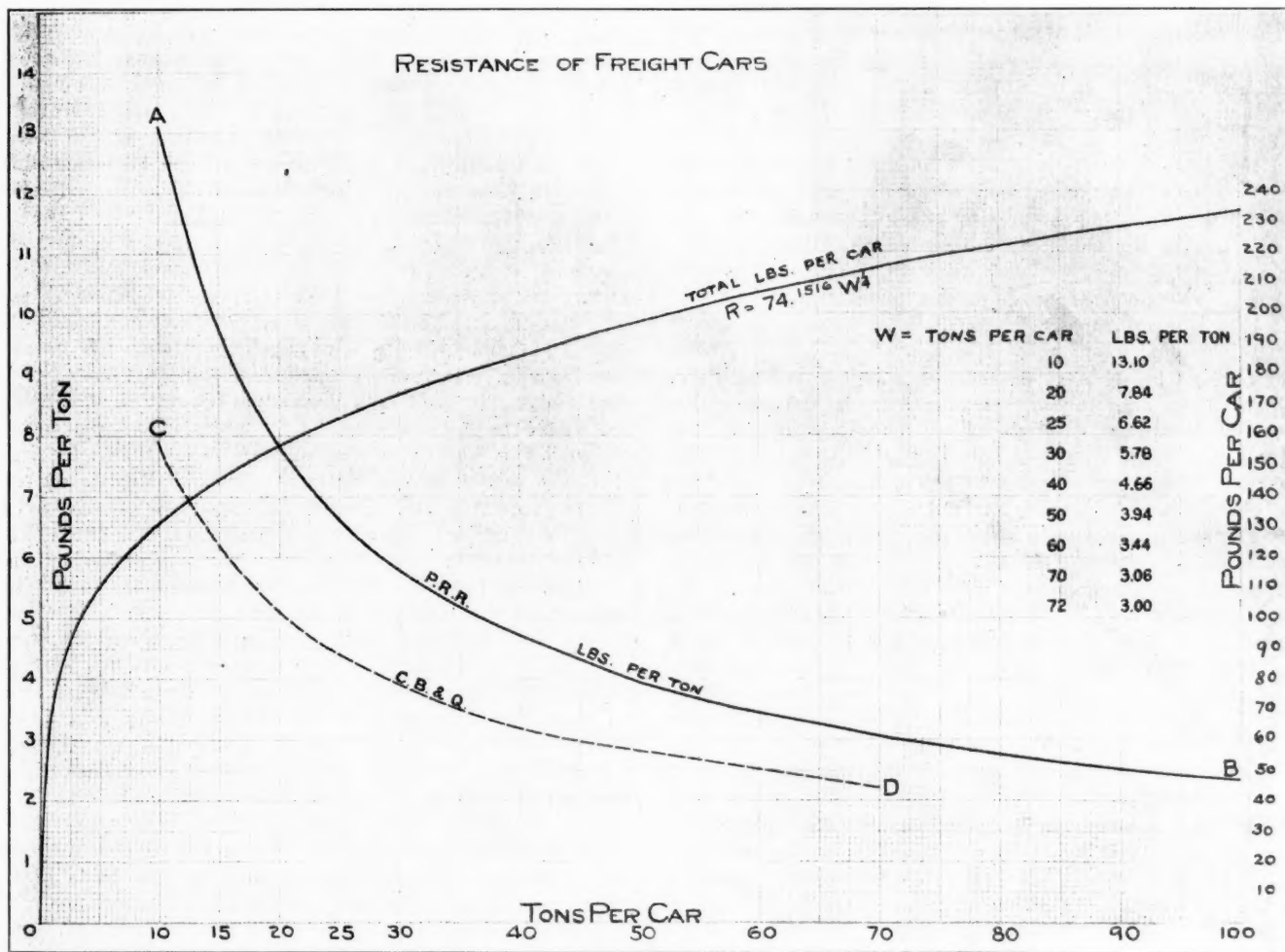


Fig. 5.

most nearly with the lubrication of the axle-boxes used on this line. The curve has been drawn for speeds between 20 miles and 53.3 miles per hour, the range which Mr. Tower's experiments cover, and for the sake of comparison it has been extended to 80 miles per hour, the assumed portion of the curve being shown by a dotted line."

It is interesting to note from the above table, that the journal friction reaches a minimum at 40 miles an hour, increasing slightly at higher speeds.

(To be continued.)

It is announced that rolling stock ordered for the East African Midland Railroad will not have the European double-

features of the classification referred to, as is well known, now vary a good deal in the different territories. The Uniform Classification Committee is composed of Robert N. Collyer (chairman), George H. Kelland and F. W. Smith, representing the Official Classification Committee; R. C. Fyffe, F. W. Meadows and Elmer H. Wood, representing the Western Classification Committee, and W. R. Powe, G. R. Browder and D. W. Longstreet, representing the Southern Classification Committee. It is believed that neither the exact things that this committee is attempting to do, nor the difficulties that, owing to the very nature of things, it must meet, are generally understood by the many persons who are directly interested in its work. It will be the purpose of the series of articles of which

this is the first to tell what the committee is trying to do, and, by referring to the obstacles, in the form of varying and conflicting transportation, economic and industrial practices, conditions and interests in the different parts of the country, that it encounters, to indicate what probably can and should be done by it and the roads it represents and what probably cannot and should not be done at present or in the immediate future toward applying a uniform classification to freight traffic throughout the country.

That substantial uniformity of classification should steadily be approached as conditions in the different sections of the country grow less diverse, and should be arrived at when conditions become something like uniform, will be conceded even by those who contend that complete uniformity is now neither practicable nor desirable. The problem for present consideration is mainly what can and ought to be done in the immediate future. But, of course, this is not the whole problem. For, as classifications and schedules of rates should be adapted to industrial conditions, so these conditions are shaped in considerable measure by classifications and schedules. The whole problem is, therefore, to approach as near to uniformity of classification as the existing diversity of conditions will justify, for the dual purpose of serving the present convenience and advantage of railways and shippers, and of shaping conditions so that complete uniformity, or a near approach to it, will, in course of time, become feasible and desirable.

In the present article will be given a brief history of the various efforts that have been made to frame a uniform classification, including the present attempt. In future articles will be treated the subjects "Unification of Rules," "Unification of Descriptions of Articles" and "Unification of Minimum Weights," which constitute the present undertaking.

So long as each railway did only a local business variances in classifications caused no trouble and were not noticed. But when through routes were formed over short connecting lines, each of which had its own classification, the differences between classifications encountered at the numerous junction points caused much trouble to both shippers and carriers. The formation of through routes over connecting lines, therefore, first developed the necessity for uniformity of classification. Most of those who complain about the diversities in the three large existing classifications have no idea of the conditions that existed twenty-five years ago. "Until 1882," says J. W. Midgley, "there were in effect on nearly every large railway system six or eight different classifications of freight." From that time efforts were constantly made by the railways in all parts of the country to reduce the number of classifications, the necessity for consolidations being made increasingly apparent by the increase in the diversity of traffic and the development of long haul business. In 1882 the "Revised Joint Classification," applying in Illinois and the northwest, was adopted. At about the same time the "Middle and Western States Classification," applying on shipments whose points of origin and destination were west of Buffalo, east of Chicago and St. Louis and north of the Ohio river, was adopted, and two other classifications were put into effect, one on west-bound and the other on eastbound shipments moving between the Middle West and the Atlantic seaboard. Still another classification was applied by the roads between Chicago and the Missouri river on westward shipments local to the territory west of Chicago and St. Louis and east of the Missouri river.

In August, 1882, a conference between the eastern and western roads was held at Niagara Falls to consider the adoption of a uniform classification for westward bound freight. Agreement being found impossible, owing to the differences of conditions and conflicting interests, the representatives of the eastern roads withdrew, but those of the western roads stayed and framed the "Joint Western Classification," applicable on both eastward and westward shipments, which was soon adopted by the roads running westward from Chicago, and

ultimately, with modifications, by the roads throughout the territory from Chicago and St. Louis to the Pacific coast. Soon after the passage of the Interstate Commerce Act, in 1887, the Official Classification, applying on all traffic north of the Ohio river and between the Atlantic seaboard and the Mississippi river, was adopted; and by 1888, after numerous conferences and a prodigious amount of work by traffic officers in various parts of the country, the number of railway classifications practically was reduced to three, the Official, the Western and the Southern Railway and Steamship, the last applying south of the Ohio river and east of the Mississippi.

These advances toward uniformity were very material aids to the Interstate Commerce Commission in enforcing the Act to Regulate Commerce, which went into effect in 1887, and to the railways in conforming to this law. They made much easier compliance with the provisions of the law requiring the quotation of through rates and prohibiting unjust discrimination. If two classifications had been retained between Chicago and New York, for example, through tariffs between these points could not have been issued in classes, because the classes would have been different east and west of junction points. Also a local classification might have rated an article higher for a shorter distance than it was rated by a through classification for a longer distance on the same line and in the same direction, thus violating the long and short haul clause. The confused multiplicity of classifications that before existed also would have made harder of detection discriminations that although not secret, because made in published tariffs, might nevertheless be unfair and illegal.

Public authorities, however, were not satisfied with the progress made toward uniformity by consolidation, and in 1887 railway traffic officers undertook to frame a completely uniform classification, or, if this were not feasible, at least to make all changes in the direction of unifying the various classifications that were practicable. Repeated conferences were held in 1887 and 1888, a standing committee of 16 members, under the chairmanship of J. W. Midgley, being at length formed. The activity of the railways was stimulated by a resolution passed by the National House of Representatives in 1888, requiring the Interstate Commerce Commission to prescribe a uniform classification by January 1, 1889. The railways' Standing Committee on Uniform Classification met in Chicago on February 23 of the same year, voted to adopt a classification containing 12 classes, and had made considerable progress in classifying leading commodities when the members from the West became dissatisfied and withdrew. When the committee met again at Saratoga, N. Y., in September of the same year no representatives of the territory west of the Missouri river were present, but it was decided, nevertheless, to proceed with the work and to frame a classification containing 11 classes of which only four should include L. C. L. ratings.

The work was suspended and resumed from time to time, and a proposed uniform classification, on the basis of 11 classes, was finally reported by the committee on June 18, 1890, which is understood to have received the approval of all the traffic associations except the Trunk Line. The Interstate Commerce Commission having intimated that it would seek authority to establish a uniform classification if the roads did not do so, the committee convened again in October, 1893, reduced the number of proposed classes from 11 to 8, provided for the making of commodity rates that seemed necessary to meet differences in conditions in the various sections, and once more submitted a report to the traffic associations. This report, it is understood, was approved by the Central Traffic Association and the Western Freight Association, but was rejected by the Trunk Line Association and the Southern Railway & Steamship Association.

The question of a uniform classification continued to be agitated more or less after this, but it was not until 1907 that it again was taken up seriously by the railways, the Inter-

state Commerce Commission, clothed with additional power by the Hepburn act, having once more intimated to the roads that unless they adopted a uniform classification it must undertake to prescribe one. The three railway classifications have been brought nearer to uniformity within the past fifteen years, but the extent to which this has simplified the difficulties surrounding the handling of through traffic has been more than offset by the development of business of greater variety, in new sections, under changing conditions and by new classifications governing intrastate traffic prescribed by state legislatures and commissions. The following states have prescribed classifications: Florida, Georgia, Illinois, Iowa, Louisiana, Mississippi, Minnesota, North Carolina, Nevada, Texas and Virginia. In some of these states, and in Kansas, Montana and Nebraska, no change in rates or classification can be made without the consent of the state railway commissions, and this results, in some instances, in the continuance, for state traffic, of classifications no longer effective on interstate traffic. Of course, uniformity of classification is an idle dream so long as the state authorities are not prepared to co-operate in good faith with the railways to secure it.

When railway officers again took up the question in 1907 they appointed a committee composed of five members from each classification territory which was directed to meet soon after January 1, 1908, do the preliminary work and determine the principles on which a uniform classification should be framed. This committee thoroughly investigated the situation and made a report dated March 31, 1908, in the course of which it said: "It is evident that material advances and reductions would result from unifying ratings in the several territories, the effect of which on (railway) revenue cannot be determined until new rate scales are made to conform to the ratings of a uniform classification, and applied to traffic moving during a representative period of time by individual carriers.

"As to the effect on trade: There are no statistics available to your committee prepared in such detail as would enable it to determine with accuracy what proportion of the freight traffic of the country is now carried on the basis of classified ratings, but having in mind the fact that through freight rates frequently affect trade, it must be apparent that the numerous advances and reductions in rates which would result from a uniform classification could not fail to have influence upon the trade conditions of the country, the extent of which could not be determined until new rate scales are made to conform to the ratings of a uniform classification, and the mercantile and industrial interests of the country have applied them to their business. With the knowledge derived from three months of earnest work, exhaustive investigation and thorough discussion, your committee expresses the belief that while establishment of a uniform classification is impracticable at this time, it can ultimately be worked out along intelligent and satisfactory lines."

In conclusion the committee said that it believed that there could be a unification of descriptions of articles, of minimum carload weights, and, with one exception, of classification rules; and "for the purpose of promptly accomplishing these measures of unification, desirable in themselves, and representing a substantial improvement in the present situation, as well as a material advance in the direction of entire uniformity," it recommended that a committee be at once appointed to carry on the work suggested.

This report was approved and in April, 1908, an executive committee of high traffic officers was appointed to have charge of the work of uniform classification, and the working committee heretofore referred to was formed to undertake the unification of rules, descriptions of articles and minimum carload weights, which work must, under any plan of unification, precede the making of uniform ratings. The traffic officers forming this working committee have been relieved of

other duties so that their time is devoted exclusively to this work.

The gravest objections that have been urged against uniform classification have been based on the disaster to commercial as well as railway interests that must result from a wholesale, revolutionary revision of ratings. These objections cannot be marshaled against what the railways are now trying to accomplish because, while the work is of great importance, only indirectly has it anything to do with the vitally important matter of ratings. What can and should be done in the direction of unified ratings, after the present committee has finished its work, is another question.

(To be continued.)

LOCOMOTIVE REPAIR SHOP OF THE MISSOURI, KANSAS & TEXAS AT PARSONS, KANSAS.

[WITH AN INSET.]

The Parsons locomotive shop of the Missouri, Kansas & Texas is one of the new western shops built in recent years with a longitudinal erecting shop. The large shop of the Rock Island at Silvis, Ill., and that of the Santa Fe at Topeka are the prominent exceptions to the general rule which provides cross tracks for locomotive repair shops in most modern plants. At the Silvis shops it will be remembered that the central track through the shop is longitudinal, but the erecting pits are arranged diagonally. The Parsons locomotive shop resembles that at Topeka in general construction and has the erecting floor at the center with side bays for the machine tools. These bays have saw-tooth roofs. The boiler and tank shop is at one end of the main building. One side bay has a balcony for light tools. The opposite side is fitted with two 10-ton electric traveling cranes operated for the benefit of the large machine tools, and these tools are driven by individual motors. The span of the erecting shop, center to center of columns, is 78 ft., and the height from the floor to the top of the rail on the crane runway is 27 ft. This shop is supplied with two 60-ton cranes. The columns supporting the crane runways are 26 ft. centers, which allows two tenders to be placed on the parallel track side by side between columns. The space provided for the repair of tenders is covered by a 25-ton crane. All these traveling cranes were supplied by Alfred Box, Philadelphia, Pa.

A riveting tower, on the west side of the main shop, was built with it, but the hydraulic pumps and other equipment for it were to be installed later. The floor of this shop is concrete, covered with asphaltum 4 in. thick. The locomotive erecting machine and boiler shop is 153 ft. x 860 ft.; the smith shop, 150 ft. x 252 ft., and the storehouse and office building, 60 ft. x 150 ft. These buildings are shown in Fig. 2; the first one to the left is the storehouse, with office and drafting room on the second floor; next to the power house, and beyond the smith shop. Two of the low brick buildings between the main shops are used for toilet and locker rooms, and one for paint stores. The ground plan of the shop and elevations of the locomotive shop were illustrated in the *Railway Age* April 13, 1906.

The shops have been in operation about two years and their output averages 40 engines per month with heavy repairs, and working 700 men 10 hours per day they have a capacity of 50 engines per month. The plans of the shops, including the structural steel work, were prepared by George R. Henderson, Consulting Engineer, New York, and he co-operated in the work with S. B. Fisher, Chief Engineer, and Wm. O'Herin, Superintendent of Machinery and Equipment. We are indebted to the latter for the photographic illustrations for this article and for the plan showing the location of the tools.

Referring to this plan, it will be seen that the machine tools for driving wheels are at the extreme end of the shop, and prominent among them are two large Sellers driving wheel lathes, which were the first to be built from the new designs

that were illustrated in detail in our issue of June 5, 1908. Next to these is a lighter lathe for truing driving axles, and opposite, along the wall, are a 600-ton wheel press, the quartering machine and lathe for steel-tired truck wheels. Farther along in the same bay are the tired boring mills and driving axle lathes. Beyond these are the tools for frames, cylinders and rods, including a large Bement slab miller, a Sellers 72-in. planer, a 48-in. Niles-Bement-Pond lathe, and a Watson-

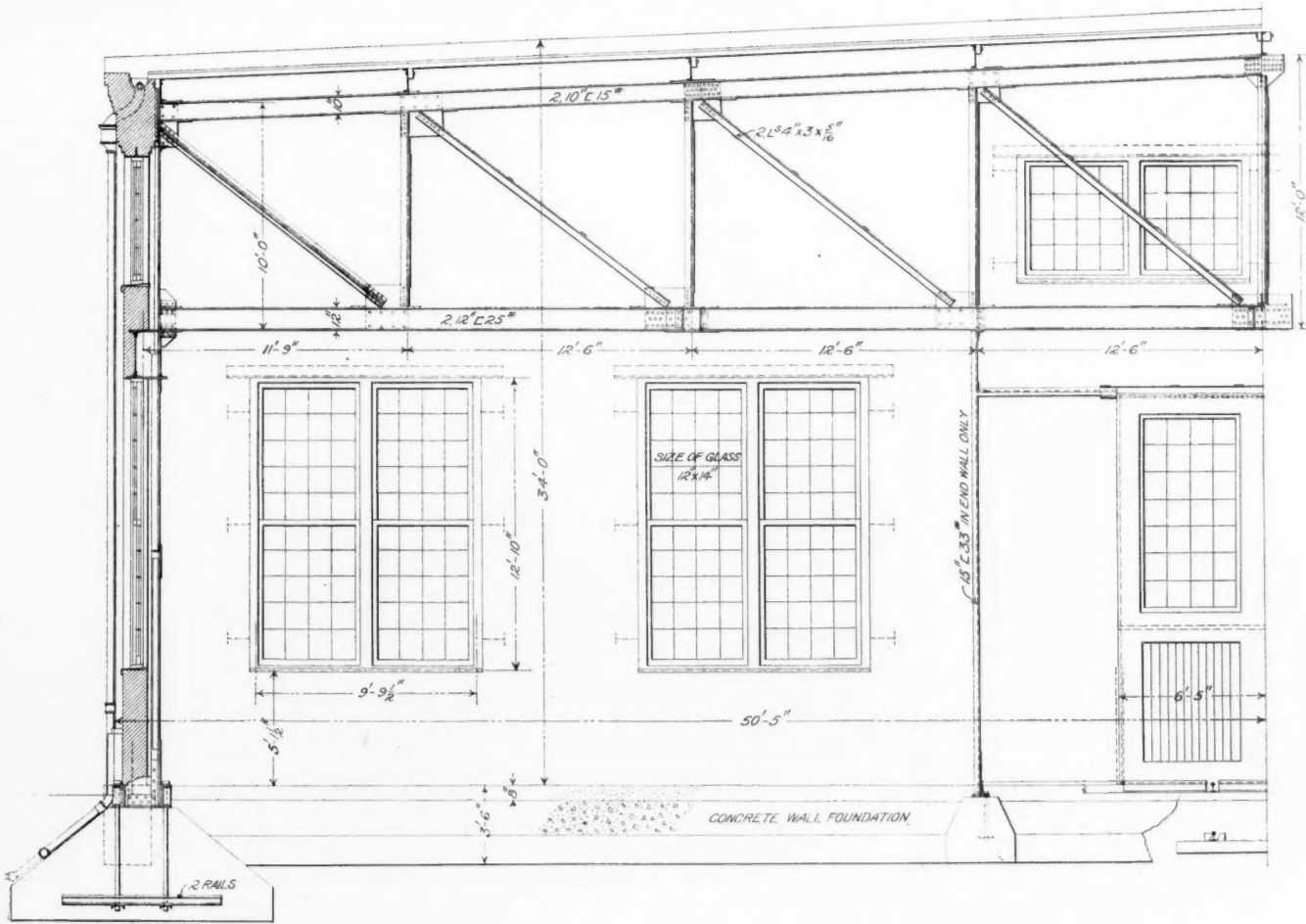
Stillman 150-ton hydraulic press for rod bushings. Nearby is the rod gang and tools for finishing the link motion, and here are located radial drills and four grinding machines. The next section in this bay is occupied with the repairs to engine trucks, and the balance of the bay contains a small tool-room, foreman's office and machinery for boiler repairs. There is a large supply tool room and foreman's office at the center of the shop, and above it on the balcony a manufacturing tool



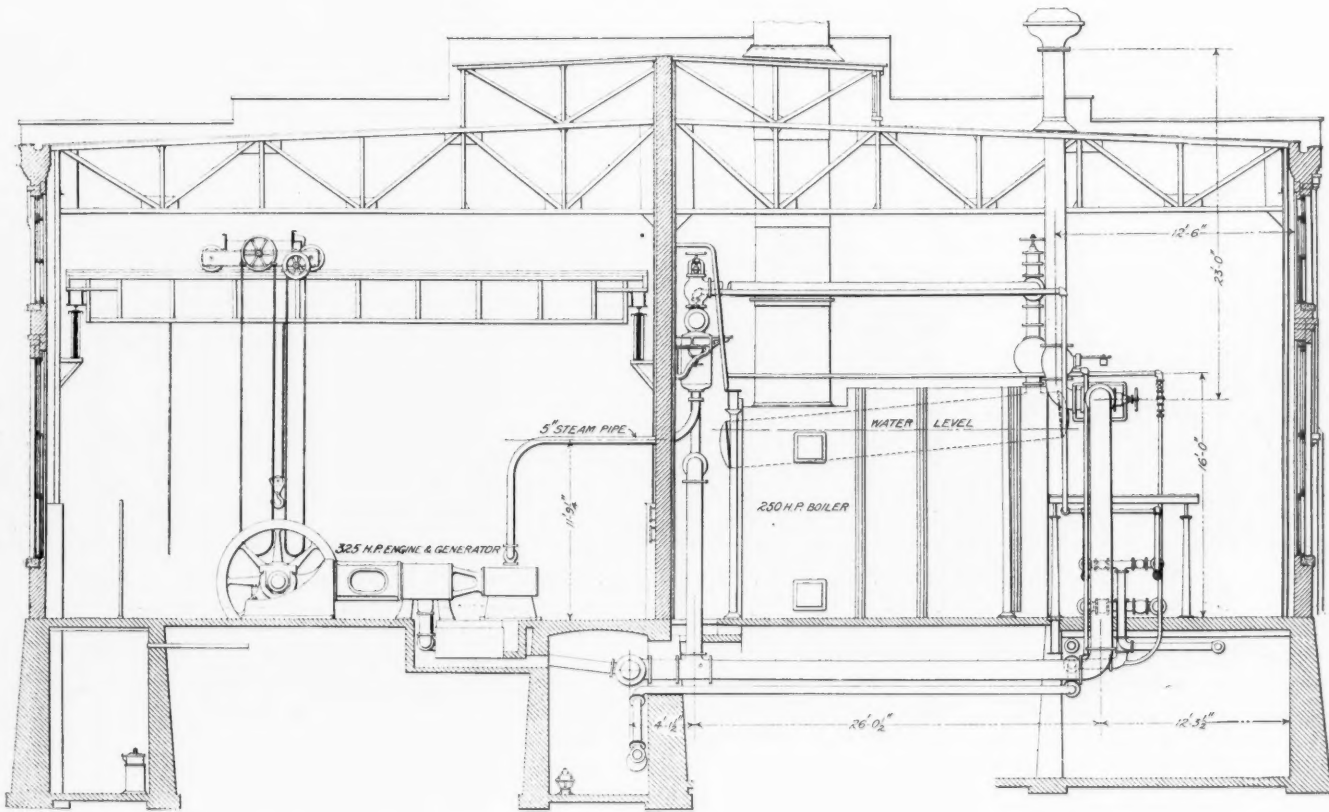
East Machine Side Bay in Main Shop.



Center of Main Shop. M. K. & T. Shops at Parsons, Kansas.



Half Vertical Section Through Smith Shop.

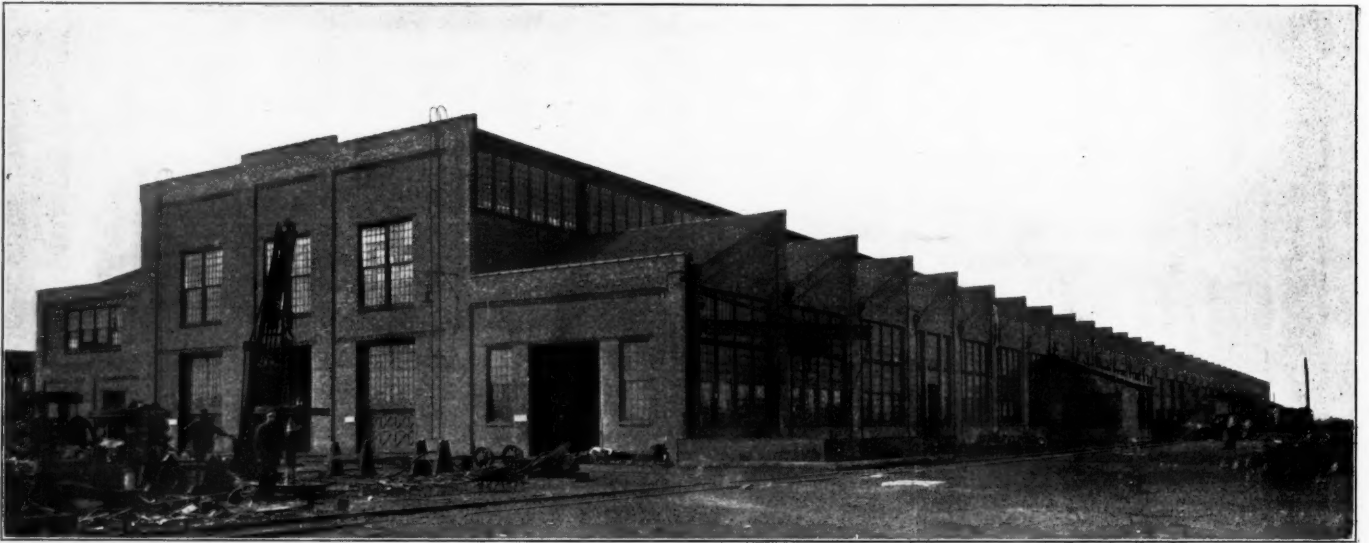


Vertical Section Through Power House. M. K. & T. Shops at Parsons, Kansas.

room, where cutting tools, special taps and reamers are finished. The floor on the opposite side under the balcony, at the extreme end, contains planers and boring mills for driving boxes, and next to this is a group of tools for pistons, including a large Norton grinder, and farther on are miscellaneous small tools. On the second floor there is a department for air brake repairs, an electrical department, principally for repairing generators for electric headlights, the tin shop, and benches for sheet iron and jacket work. The space occupied

a.c. Westinghouse generators. There is also an Ingersoll-Rand air compressor having a capacity of 2,000 cu. ft. of free air per minute, and two 1,000-gal. fire pumps, made by Fairbanks, Morse & Co., Chicago.

The smith shop is 100 ft. wide and 252 ft. long. The roof truss has a clear span without any central or intermediate support, and is specially designed for irregular loading. These trusses are 12 ft. high at center and 10 ft. at side walls. The lower member is made of 12 in. channels with lattice bars,



East Side of Main Shop.

by tools as indicated by the plan does not nearly fill the shop, and ample room remains for additional tools, so that the capacity of the erecting shop may be further increased in this way.

In the power house, natural gas is used for fuel at a cost of 7 cents per 1,000 cu. ft. It is piped in from the gas fields 20 miles away, and is also used for the furnaces in the smith shop, for flue welding and for tempering tools.

The power house is 81 ft. 1 in. x 153 ft. 5 in., and it is

2¼ in. x ¾ in. The truss was designed so that a load of 3 tons could be applied either vertically or horizontally at any point by simply attaching it to the lower chord of the roof truss. The provision for vertical loading takes care of any chain hoist which might be used for lifting heavy weights, and the horizontal loading allows for the thrust of the top post of jib cranes.

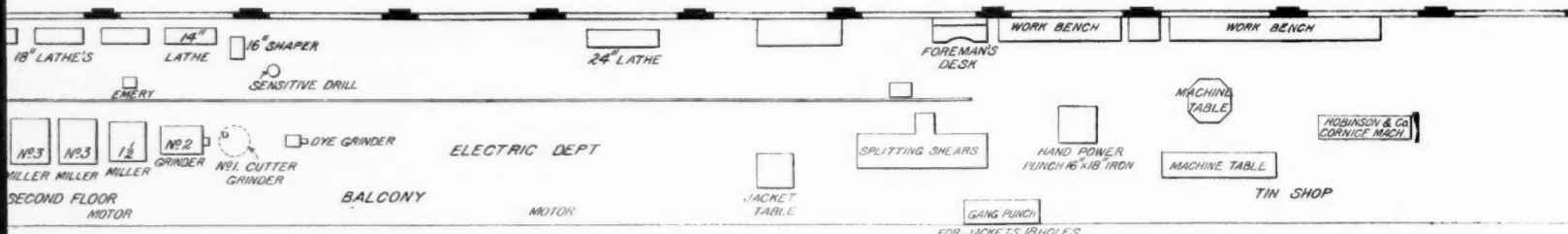
We recently referred to the increasing use of cast steel, malleable iron and wrought iron as substitutes for brass for



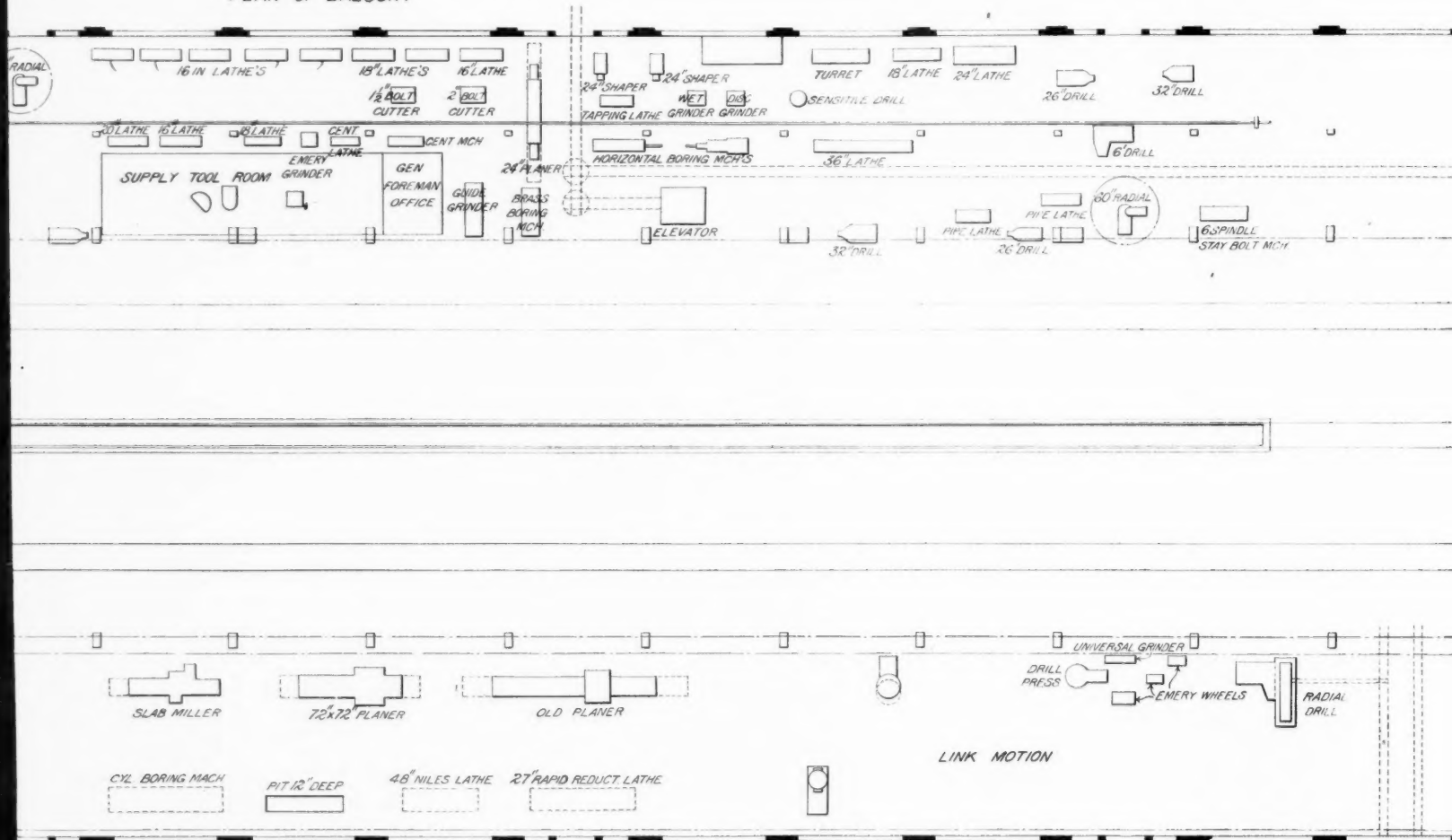
West Side of Main Shop. M. K. & T. Shops at Parsons, Kansas.

divided into two sections by a longitudinal partition, making the engine room and the boiler room each 40 ft. wide inside. There are six water tube boilers, each 250 h.p., made by the John O'Brien Boiler Works Co., St. Louis, Mo. Each pair of boilers has a sheet iron stack lined with fire brick, 58 in. in diameter outside and 60½ ft. high. The engine room is fitted with a Maris Bros. 15-ton hand traveling crane. There are five engines, made by the Fitchburg Steam Engine Co., Fitchburg, Mass., three of them being connected to 200-kw., d. c. Westinghouse generators, and two of them to 200-kw.,

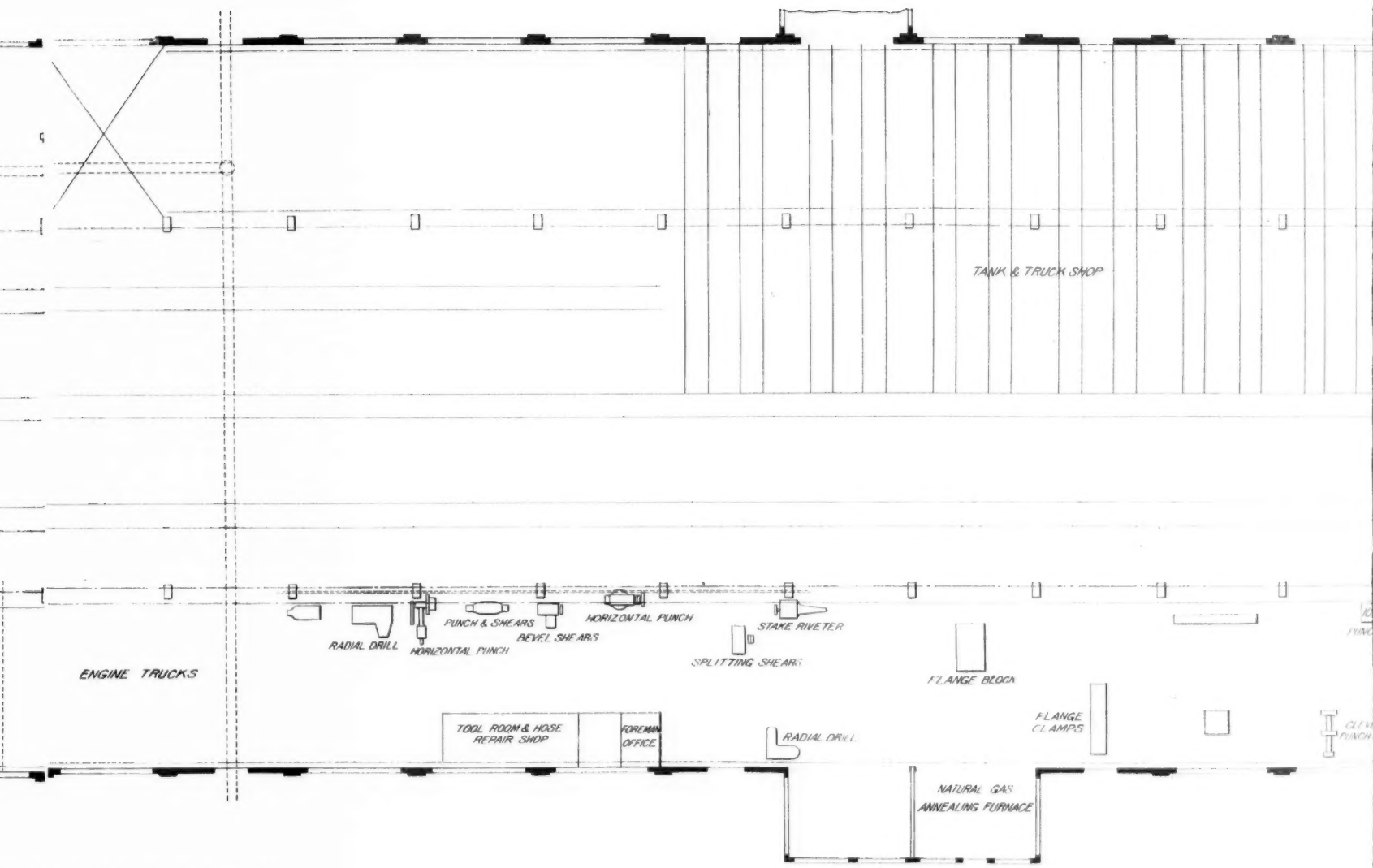
small locomotive fixtures, and an example of this is the cast steel bodies for injector checks as used by the Santa Fe. At the Parsons shop, cylinder cocks and rod cups are made of wrought iron pressed hot to shape in dies, and they are not only much cheaper in first cost but much more durable. It is the practice at this shop to bore driving boxes to fit, and no scraping or hand fitting is used. Many hot boxes are caused by too close fitting, and the inward expansion of the bronze bearing by slight heating causes excessive friction which results in overheating.



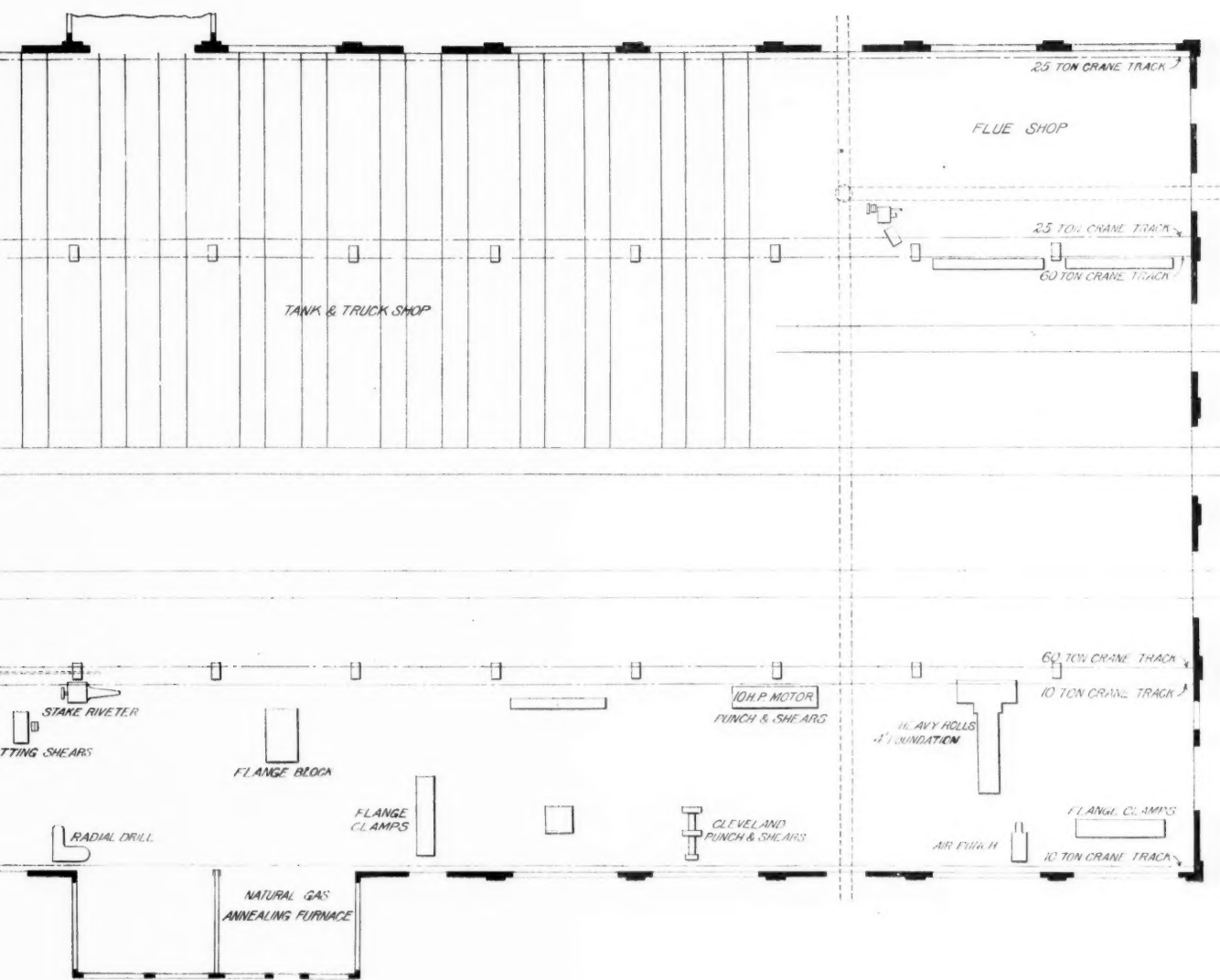
PLAN OF BALCONY

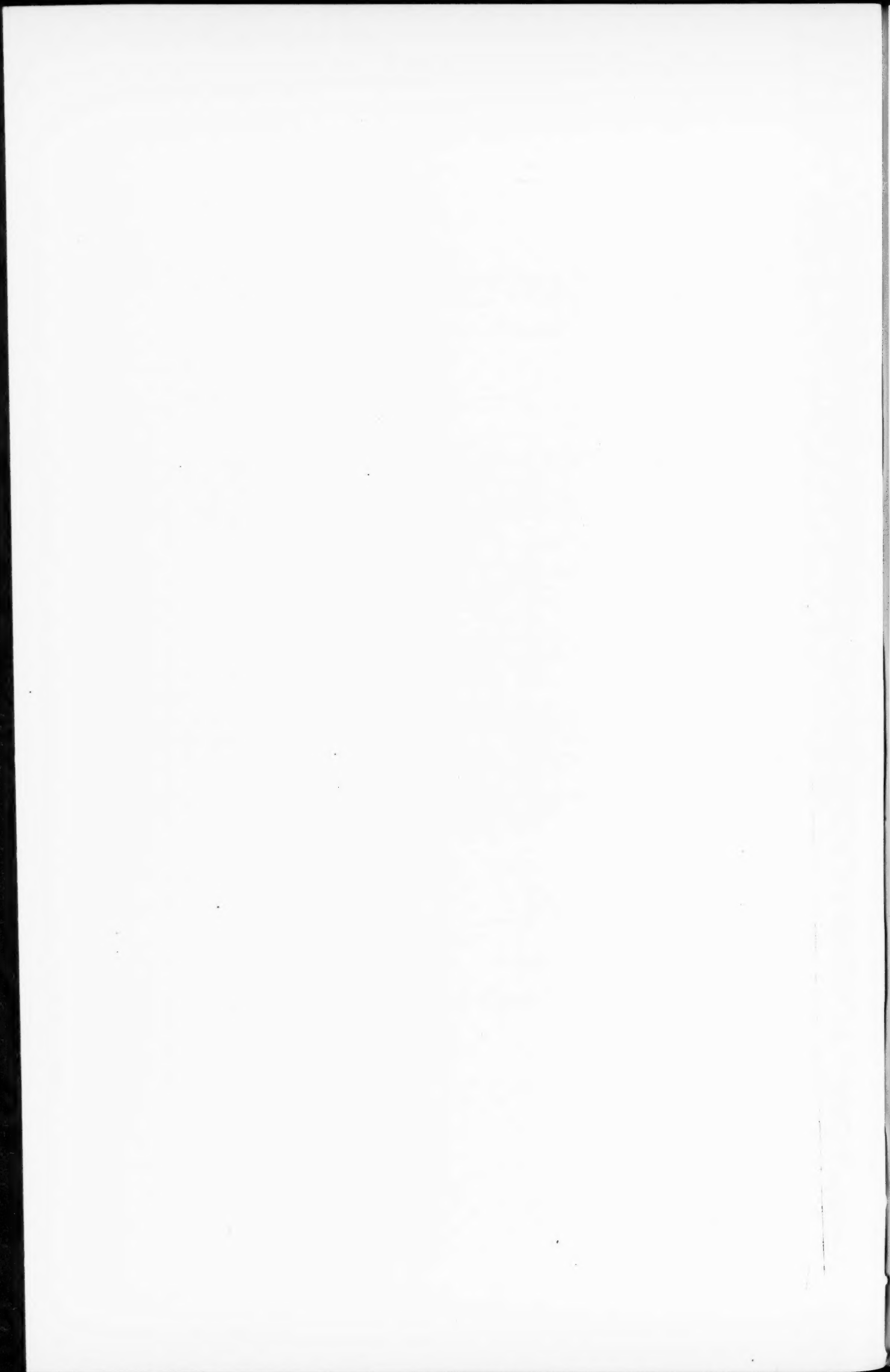


MAIN SHOP; LOCOMOTIVE REPAIR SHOP OF THE MISSOURI, KANSAS & TEXA



TEXAS, AT PARSONS, KANSAS.





General News Section.

It is understood that the lawyers for the Interstate Commerce Commission will work up the commission's side of the Missouri river rate case in time for presentation to the Supreme Court at its October session.

The employees of the Southern Railway's shops at Spencer have been placed on a nine-hour working day basis instead of eight as heretofore. This order affects all the departments. It is said that all other shops belonging to the Southern will be on the same basis.

The Michigan Railroad Commission has issued an order prohibiting new railways in the state from running trains backward or with the cars ahead of the engine. The roads must put in Ys or some other devices to avoid the prohibited practices within 90 days.

On August 27 the water scoop of the tank of an engine on a Pennsylvania express train fell at a point near Florin, Pa., tearing up a long stretch of track, and throwing ballast against the train moving in the opposite direction with sufficient force so that many windows were broken.

Four railway ticket scalpers were fined by Judge McWilliams of the circuit court at Chicago on August 25 for alleged violation of an injunction against brokerage in railway tickets, which was issued at the instance of the Illinois Central in December, 1908. The prosecutions were instituted by the Railway Ticket Protective Bureau.

The Chicago Terminal Transfer Co. announces that on Sept. 1 the freight claim department will be transferred from the traffic department to the accounting department. All correspondence pertaining to the filing, investigation and adjustment of freight claims, both loss and damage, and overcharge, should be addressed to F. B. Huntington, comptroller, 308 Grand Central Station, Chicago, Ill.

September 30 is to be observed as "Rice Day" on the Galveston, Harrisburg & San Antonio. On that day rice will be served in the dinners, railway men will be asked to have rice for their meals and everybody along the system will be requested to serve rice in some style. The rice day is a result of the success of the prune day that was inaugurated some time ago by the California growers. A folder is being sent out by the passenger department of the Galveston, Harrisburg & San Antonio which explains how to cook rice in 57 different ways.

On the night of August 31 train No. 39, the Pittsburgh express of the Pennsylvania, was held up and robbed near Lewistown Junction, Pa., by a single highwayman. The train was made up of two express cars and four sleepers. The robber stopped the train by putting dynamite on the track and forced the express messenger and the train crew to help him in getting the money out of the express car and carrying it some distance up the track. The press despatches say that while the man took a number of thousand dollars from the car he only succeeded in carrying off with him a little over \$50.

The committee appointed by President Taft to consider methods of improving the effectiveness of the Sherman Anti-Trust law held its first meeting, Aug. 30, in the rooms of the Bar Association, New York City. Attorney General Wickersham presided, and besides him those present were Secretary Nagel, of the Department of Commerce and Labor; Solicitor General Bowers, Congressman Chanler Townsend, of Michigan, and Commissioners Knapp and Prouty, of the Interstate Commerce Commission. The meeting was an executive session and no reports will be given out by either the committee as a whole, or by individual members.

The Interborough Rapid Transit Company and the New York City Public Service Commission are still at a deadlock in regard to the proposed extension of the New York subway system. The Interborough Rapid Transit Co. has proposed a comprehensive plan of extension which the commission has rejected on the ground that it conflicts with its own plans for

a general future system. On the other hand, the plan the commission makes cannot provide for a through rate of fare over the existing subway lines. Local sentiment is strongly expressed to the effect that the commission is blocking rather than directing a great improvement work.

Extension of Hine System.

The Hine system of organization has been extended to the Oregon and Washington divisions of the Oregon Railroad & Navigation Company, and also to the Southern Pacific lines in Oregon, according to circulars dated Aug. 23.

Effective Aug. 24, the Washington division discontinues among its officers the use of the titles, division engineer, master mechanic and chief dispatcher. The following officers are designated: 1, W. M. Gleason, assistant superintendent, previously asst. supt.; 2, R. O. Cowling, assistant superintendent, previously asst. supt.; 3, J. H. Robb, assistant superintendent, previously division engineer; 4, T. F. Quinn, assistant superintendent, previously master mechanic; 5, H. L. Buchanan, assistant superintendent, previously chief dispatcher; 6, J. Beck, assistant superintendent, previously chief dispatcher.

Effective Aug. 24, 1909, the Oregon division discontinues among its officials the use of the titles, master mechanic, division engineer, chief dispatcher and traveling engineer. The following named officers are designated: 1, J. D. Matheson, assistant superintendent, previously asst. supt.; 2, J. T. Langley, assistant superintendent, previously master mechanic; 3, A. F. Stotler, assistant superintendent, previously division engineer; 4, A. Buckley, assistant superintendent, previously asst. supt.; 5, W. E. Borden, assistant superintendent, previously chief dispatcher; 6, J. F. Corbett, assistant superintendent, previously chief dispatcher; 7, J. C. Shea, assistant superintendent, previously traveling engineer.

Effective Aug. 24, the Southern Pacific lines in Oregon discontinue the use of the titles, master mechanic, division engineer and chief dispatcher. The following named officers are designated: 1, C. W. Martyn, assistant superintendent, previously asst. supt.; 2, T. W. Younger, assistant superintendent, previously master mechanic; 3, C. C. Blood, assistant superintendent, previously division engineer; 4, C. H. Fox, assistant superintendent, previously chief dispatcher; 5, E. B. Pengra, assistant superintendent, previously chief dispatcher.

Fire Protection at Altoona.

The Pennsylvania announces that it has more than seven miles of water mains in its Altoona shops, with 72 two and three-way hydrants, supplying 184 streams of water. To guard against breakages in the mains, clogs from mud and similar troubles experienced so frequently by municipal fire departments, the company has adopted the method of laying parallel mains under its shops and equipment yards, so that by the use of gate valves any part of a broken main can be cut off to itself and in no way interfere with the flow of water to the different hydrants.

Running a Railway to Suit Its Patrons.

General Passenger and Freight Agent H. M. Adams, of the Astoria & Columbia River Railroad, said this morning that the winter schedule on the Lower river route would be made out to conform to the expressed wish of the majority of patrons of the line. That is, if 500 duck-hunters living here or anywhere along the route to the shooting grounds specify a certain schedule, and only 499 other people want some other time-card put into effect, the Nimrods will win.

The company, according to its officials, is able to make such a public proposition, for the reason that the A. & C. R. is

entirely independent of through passenger schedules, which gives it a chance to maintain a very elastic schedule.

"We are just preparing our winter schedules now," said Mr. Adams, this morning, "and we are going to ask the patrons of the road to help work out our time-cards, and we want to hear from the duck hunters especially. The season will open the first of September, and by the time we announce our winter service, which goes into effect about September 15, they ought to have their minds made up as to the most convenient schedule for them.

"We are going to try this plan and see how it works out, and the traveling public is cordially invited to tell us what they want."—*Portland (Oregon) Evening Telegram*, August 23.

Union Pacific Bureau of Information and Education.

The Union Pacific has issued additional circulars regarding its Bureau of Information and Education, established September 1. Vice-President Mohler writes that this bureau is to be supplementary to the Hine method of training men, and that it will give an opportunity to men in the service of the company only to qualify for higher duties in the service without any expense to them. The educational features are devised from a practical standpoint; conditions in modern operation are constantly changing, and the men will get up-to-date practice from leading authorities in each department. For example, if a man in the mechanical department has a desire to develop himself to be a superintendent of the motive power department, he has that opportunity given to him.

In addition to the plan as outlined below there will be assigned to each department an expert in his particular work, who will furnish the bureau with the information desired by employees. It is the intention later on, as the school becomes larger and established at division points, for the principal officers to meet with the school and address it on matters of importance. Mr. Mohler points out that the railway body politic is a large part of the American Union and is intimately interwoven with the prosperity of transportation lines, and hence with that of the nation.

Circular No. 22, dated from Omaha, August 20, reads as follows:

On September 1, 1909, this company will establish an educational Bureau of Information, the objects of which will be: First, assisting employees to assume greater responsibilities; second, increasing the knowledge and efficiency of employees; third, preparing prospective employees for the service.

Employees in all departments may secure information pertaining to their duties, or on general railway subjects of interest to them, without expense. It is desired that all departments take advantage of the opportunities afforded by this bureau in preparing persons to qualify for service.

Mr. D. C. Buell is appointed chief, and Mr. G. W. Seiver, assistant chief of this bureau, with headquarters in the Pacific Express building, Omaha, Neb.

Circular giving complete information regarding the operation of the bureau will be issued in the near future.

Circular No. 23 was issued August 25, and contains the following announcement:

Announcement of plans and privileges of the educational Bureau of Information of the Union Pacific Railroad Company, referred to in general superintendent's circular No. 22, August 20, 1909.

The fundamental reasons for establishing the educational Bureau of Information are: First, to assist employees to assume greater responsibilities; second, to increase the knowledge and efficiency of employees; third, to prepare prospective employees for the service.

The privilege of using this bureau is open to all departments and employees free of any charge, the company maintaining the bureau for the benefit of the entire service.

The work of the bureau will be controlled by a board of supervisors, consisting of the following officers of the company: Vice-president and general manager; freight traffic manager; general superintendent; chief engineer; superintendent motive power and machinery.

An advisory board, consisting of employees selected from the various departments, will act with the chief of the bureau in handling all questions relating to their respective departments.

All communications will be addressed to "Chief, Bureau of Information, Pacific Express building, Omaha, Nebraska."

ASSISTING EMPLOYEES TO ASSUME GREATER RESPONSIBILITIES.

The bureau will offer any employee desiring to qualify himself to assume greater responsibilities a course of reading and study along the line which he may indicate. This course will be conducted somewhat on the method of now existing correspondence schools, and will be prepared with special reference to the needs of the particular case. This course need not necessarily be confined to the particular work of the department with which the employee is connected, but may embrace any subject, the knowledge of which may be of value to the employee in the position now occupied or which would help to qualify the employee to change positions to a line of work which would be more nearly suited to his ambition or desire.

An employee taking up a special line of work of this kind must show his interest in it by doing a reasonable amount of reading or studying. Otherwise the company will not be justified in continuing the expense of maintaining the employee on its student rolls.

Those selected for advancement to minor official positions will be afforded an opportunity, before formal appointment is made, of acquiring a knowledge of the practical workings of such departments as they have not been intimately connected with, through a temporary connection therewith under the direction of the heads of such departments, and at a salary fixed by the board of supervisors.

INCREASING THE KNOWLEDGE AND EFFICIENCY OF EMPLOYEES NOW IN THE SERVICE.

This bureau offers to all employees the opportunity to increase their knowledge, thereby increasing their efficiency, by means of the information department feature. Employees desiring information on any problem or proposition connected with their work, or on railway matters in general, can, without any formality, address this bureau, stating the information desired. Name and address, position or occupation, division, district, office or shop where employed should also be stated.

This information will be furnished promptly and in as simple and practical a manner as possible.

All inquiries will be addressed to the Chief of the Bureau of Information, but any inquiry requiring special departmental information will be referred to the member of the advisory board best qualified to give the information desired, it being the intention to have all inquiries answered in such a manner that they will in no wise conflict with the instructions, ideas or precedents of the department to which they relate. Questions referred to members of the advisory board will not carry the names of the employees desiring the information, although a record will be kept available to the heads of departments wishing to know whom of their employees are seeking to increase their knowledge of railway matters.

It is the intention to further this work by means of lectures on live railway subjects, to be given from time to time at various district headquarters. Pamphlets and reports will be distributed periodically, containing information on subjects of interest. Classes will be organized at various points to teach important subjects, and a representative of this bureau will be continually on the road to handle matters which cannot be properly explained or demonstrated by correspondence.

PREPARING PROSPECTIVE EMPLOYEES FOR THE SERVICE.

This bureau will be glad to register the names of dependents or relatives of employees who wish to enter the service of the company, and will also keep in touch with various universities, colleges, high schools and technical schools for the purpose of having at all times material on hand to supply help desired by any of the departments. Persons registering with this bureau may indicate the particular line of work which they desire to follow. They will be given every opportunity for learning the elementary methods and requirements of the department they wish to enter, and while it is not promised that positions will be given to all applicants, it is, however, expected that the various departments will avail themselves of this opportunity for filling vacancies in their ranks from individuals registered with this bureau, who have taken advantage of the opportunity to qualify themselves for the positions desired.

Signal Tests on the Pennsylvania.

Over 156,000 signal efficiency tests were made by the Pennsylvania Railroad in the first six months of this year, and a nearly perfect record was made. The average number of tests made each day was 862, and of the total for the six months, 99.6 per cent. were perfect. In the .4 per cent. of failures are included the cases where enginemen passed signals by a few feet before stopping their trains, and similar cases, which, though technical violations, were not such as would make possible an accident to a train. The tests made in the first six months of this year were divided into four classes, in which the following records were made by the men: Block signal rules, 24,292 tests, of which 99.6 per cent. showed perfect observance on the part of employees; rules governing flagmen and the use of fuses, torpedoes and other signals, 23,042 tests, with 99.5 per cent. perfect; trains ahead of schedule time, 53,503 tests, with 99.7 per cent. perfect; signalmen relieving each other, 99.9 per cent. perfect out of 56,112 tests.

The New York division showed a perfect record in all signal tests, as did the Cresson and the Central divisions. On the Sunbury and Shamokin divisions a total of 8,732 signal rule tests were made and in only nine cases was the observance imperfect. Nine of the 26 divisions reported perfect observance of all block signal rules; five were perfect in other signals, 21 in trains running ahead of schedule time, and 10 in signalmen relieving each other.

A Heavy Train on the Lake Shore.

Engine No. 4598 on the Lake Shore & Michigan Southern on August 24 hauled 100 steel cars loaded with 7,433 tons of ore from Ashtabula, Ohio, to Youngstown, a distance of 65 miles, in 5 hours and 15 minutes. This beats the record of the New York Central engine referred to in the *Railroad Age Gazette* of August 13, 1909, page 289.

Canadian Northern Coal Companies.

The Brazeau collieries and the Rocky Mountain collieries, two companies capitalized at \$1,000,000 each, and controlled by interests friendly to the Canadian Northern Railway, have been incorporated. The Brazeau collieries will operate an area of about 4,000 acres of coal bearing land situated on the Brazeau and McLeod rivers, about 175 miles west of Edmonton, Alb. The Rocky Mountain collieries will be located on the Kanakasis river, Alberta, where the Canadian Northern is alleged to be negotiating for an interest in a large tract. The coal of both deposits is understood to be a good grade of bituminous, and the mines will be worked mainly by the supply of the western sections of the railway.

Motor Service on St. Joseph & Grand Island.

It is said that motor car service will be installed on the St. Joseph & Grand Island to cover the entire line. Superintendent Berlingett is quoted as follows: "Five motor cars have been ordered. The first car will arrive about the middle of September and will be put into service at once. It will start from Marysville at 7 o'clock in the morning, running east as far as St. Joseph, and returning to Marysville in the evening. By the middle of October the second car will have arrived, and it will be run from Hiawatha west as far as Fairbury, and then turned and run back to Hiawatha. The third car will start from Fairbury, making the run to Grand Island and return each day. The fourth and fifth cars will be run between Kansas City and St. Joseph."

Pennsylvania Relief Fund Benefits.

According to reports issued Aug. 30 the relief funds of the Pennsylvania System have in 23 years paid out a total of \$26,702,948 in benefits to employees of the railway. Of this amount \$15,896,426 was paid to members who were unable to work, while the remainder, \$10,806,522, was paid to the families of employees who died. Reports for July show payments amounting to \$98,294 on the Lines East of Pittsburgh and

Erie. To members incapacitated for work \$59,797 was paid, while to the families of members who died there was paid the sum of \$38,497. The total amount paid out of the relief fund of the Lines East of Pittsburgh since it was established in 1886 is \$19,477,987. On the Lines West a total of \$43,165 was paid out in the month of July; \$20,000 representing the amount paid in benefits to the families of members who died, and \$23,165 for the relief of members who were unable to work. Since the organization of the relief department on the Lines West in 1889 there have been paid in benefits a total of \$7,224,961.

Street Railway Air Brakes Ordered by Commission.

Following the action of the Wisconsin railway commission, which decided that the cars of the Milwaukee Electric Railway & Light Company must be equipped with air brakes, the Milwaukee common council has passed an ordinance compelling the company to equip its cars by Sept. 12, 1912.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

- AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
- AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa. June, 1910; Niagara Falls, Ont.
- AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
- AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
- AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York, Nov. 17; Chicago.
- AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
- AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago. March 14-17, 1910; Chicago.
- AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago.
- AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago.
- AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
- AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
- AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 4-8; Denver, Colo.
- ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. June 29, 1910; Colorado Springs.
- ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.
- ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago. May 16-20, 1910; Los Angeles.
- ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y. Dec. 14-15; Chattanooga.
- CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
- CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
- CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
- FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va. June 15, 1910, California.
- INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
- INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
- INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago.
- IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month; except July and August; Des Moines.
- MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago.
- NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
- NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
- NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
- RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month; except June, July and August; Pittsburgh.
- RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; Oct. 12-14; Louisville, Ky.
- RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.
- ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Sept. 14-17; Washington.
- ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
- SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Hotel Champlain, N. Y.
- SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La. Oct. 21; Birmingham, Ala.
- SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
- TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R., East Buffalo, N. Y.; September, 1909; Denver.
- WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
- WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
- WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

Effective October 1, the rate of storage for shingles at the St. Paul and other storage plants will be increased from \$5 to \$7.50 per car for the first 30 days.

The new Canadian Northern through service between Montreal and Quebec was inaugurated August 22, and trains started from each terminal, satisfactorily reaching their respective destinations August 23.

On August 19 the National Railways of Mexico took over the express business of the republic. The system is still being operated by the old Wells-Fargo officers, but the railway president and board of directors have become officers of the express company.

Last week 123 automobiles were shipped in one trainload from Detroit to Minneapolis. The shipment required forty-one 36-ft. cars, three automobiles to a car. This is doubtless the largest single shipment to one consignee ever made by an automobile manufacturer.

No announcement has yet been made by the roads handling import traffic from Baltimore and Newport News of their intention regarding the reduction in the Boston & Maine import rates to the Baltimore and Newport News level on September 1, thus abolishing the present differential.

The Trunk Line Association, on August 26, discussed the question of a new freight differential from New Orleans, but came to no conclusion and adjourned until September 13. In the meantime new data will be compiled on the main points involved—that of rates into the territories of the Central Traffic Association.

The Philadelphia Commercial Exchange has appointed a special committee, which has been in conference with officers of the Central Freight Association and of the trunk lines, concerning the abolition of the \$2 diversion charge on cars sent east. In case of unfavorable action the grain men threaten to route their shipments over roads favoring the abolition of the charge.

The new Missouri, Kansas & Texas through train schedule

between St. Louis and Texas goes into effect September 19. The train will be entirely new, and will run on a slightly faster schedule than the "Katy" flyer. The company has offered a prize of \$50 for the best name for the train, and asks that communications on the subject be addressed to the general passenger agent at St. Louis.

The Interstate Commerce Commission has rescinded temporarily the order requiring railways to reduce the proportional rates from Chicago to Des Moines, Iowa, and the railways have dismissed their suit to enjoin the commission in this case. The commission has rescinded the order pending an appeal to the supreme court of the Missouri river rate case which involves the same principle.

Announcement has been made that the Union Pacific will operate an additional limited train between Portland and Chicago on a 69-hour schedule. The Hill roads expect to be able to equal or exceed this schedule through the saving effected in operating trains between Spokane and Portland over the North Bank road. Joint passenger tariffs have also been filed, operative over the North Bank road and the Northern Pacific Steamship Company's coasters, the "Elder" and the "Roanoke," and when the "Elder" sails from Portland on September 28 it will carry the first through passengers for California by a solid Hill route.

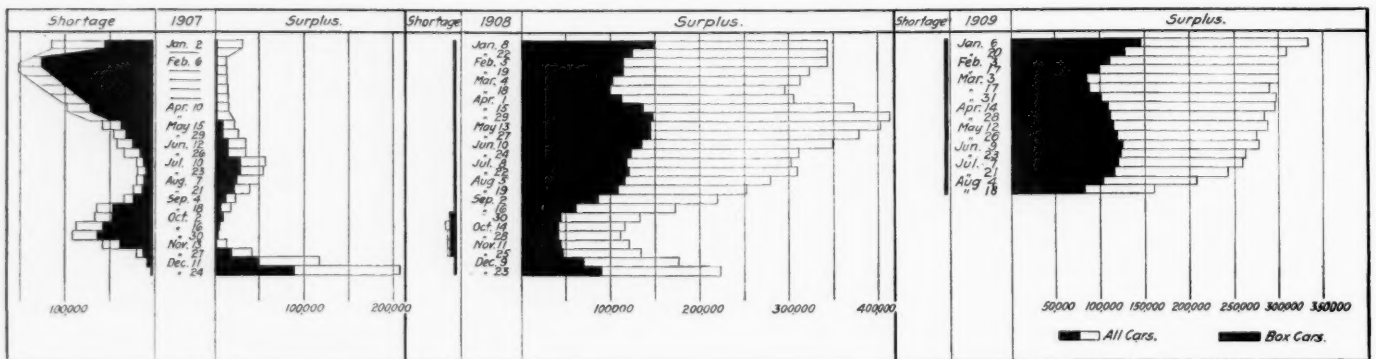
Grain exporters at New York are bringing pressure to bear upon the railways to reduce the rate on grain shipments from Buffalo to New York. The exporters say that they cannot compete with Montreal at the present rate of 5½ cents a bushel, and ask for a 4½-cent rate. This 4½-cent rate was actually in effect for two months last spring, but was withdrawn last June. The argument of the New York lines is that the Montreal lines are in a position to influence a differential below any rate established in New York, and also that the additional ocean tonnage coming to New York gives grain shippers an advantage which more than offsets the rail charge.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, present-

CAR SURPLUSES AND SHORTAGES, APRIL 29, 1908, TO AUGUST 18, 1909, INCLUSIVE.

	Surpluses.					Shortages					
	Number of roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
August 18, 1909.....	169	82,505	5,953	42,158	28,808	159,424	556	277	1,076	100	2,009
August 4, 1909.....	169	103,646	6,985	61,486	35,056	207,173	334	243	986	63	169
July 21, 1909.....	165	116,221	9,971	78,675	38,487	243,354	106	169	31	33	339
June 23, 1909.....	166	121,441	12,099	89,292	40,112	262,944	211	190	193	233	827
May 26, 1909.....	158	118,077	14,940	97,006	43,687	273,710	83	99	1,011	47	1,240
April 28, 1909.....	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
March 31, 1909.....	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
February 17, 1909.....	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
January 20, 1909.....	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908.....	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908.....	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908.....	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908.....	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908.....	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908.....	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908.....	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908.....	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908.....	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267



Car Surpluses and Shortages in 1907, 1908 and 1909.

ing statistical bulletin No. 53, giving a summary of shortages and surpluses from April 29, 1908, to August 18, 1909, says:

"During the fortnight elapsed since our last bulletin there was a further decrease of 47,749 in the number of surplus cars, bringing the total down to 159,124, which is 93,579 less than the corresponding period in 1908. Box cars decreased 21,141 and coal and gondolas 19,328. There was also a decrease of 6,248 in miscellaneous cars, due principally to a reduction in the surplus stock equipment. The heaviest reductions are in groups 2 (Eastern) and 3 (Middle), although group 10 (Pacific) also shows large decreases, particularly in box cars. Group 6 (Northwestern) again reports a slight decrease due to the accumulation of box cars. There is an increase in the scattering shortages from 169 on August 4 to 2,009 on August 18."

Chicago Great Western Terminals at Minneapolis.

The reorganized Chicago Great Western has obtained from the former Wisconsin Central an option upon its Hennepin avenue freight house, roundhouse, trackage and other terminal property in Minneapolis. It is reported that the stipulated price is \$2,000,000, and that if the Great Western exercises its option it will take over the leases by which the Wisconsin Central formerly operated into Minneapolis over the Great Northern tracks. This will give the Great Western entrance into the Minneapolis union depot. Mr. Felton is quoted as saying that the Chicago Great Western will have to spend between \$15,000,000 and \$18,000,000 during the next three years, but that these expenditures would enable the property in a short time to earn more than \$5,000,000 per year net. The highest net earnings ever reported were \$2,311,668 in 1906.

British Passenger Traffic.

There are two very important lessons to be learned from the Board of Trade's figures on the British railways in 1908, and they are commended to the operating officers of our steam roads and traction systems. The first is that it pays to make the passenger comfortable. Speed, safety (not a passenger killed in Great Britain in 1908), punctuality, cleanliness, civility and reasonable rates are all factors in the proposition. A bad service makes the traveler stay at home, but he is willing enough to help along with the dividends if the service is made attractive.

The second lesson, which we ought to have learned long ago but only seem to acquire very slowly, is that increased facilities make increased travel. Everybody, except perhaps the Interborough management, recognized this when our subway was extended to Brooklyn. The Hudson tunnel service has created a passenger traffic which never even existed before. The Pennsylvania tunnel will do exactly the same thing and will start next summer. The matter is urgent to the last degree. Perhaps our Public Service Commission will take example from a country where there has been no corresponding increase in population with the growth of railway travel and get our new subways under way at once.—*Wall Street Journal*.

STATE COMMISSIONS.

The Railroad Commission of Michigan has issued an order prohibiting railroads from running combination passenger and baggage cars with the passenger part of the car ahead.

The Nebraska Railway Commission issued a ruling on August 28 that in future any passenger on any train may ride in a Pullman sleeping car without paying extra therefor if he cannot find a seat in an ordinary coach. If, however, after he takes his seat in a Pullman a seat in a day coach becomes vacant, he must change to it.

The New York Public Service Commission, Second district, has ordered the Newark & Marion Railway to stop all its passenger trains on signal at its crossing of Mill street in the village of Marion, and provide such facilities for the em-

barking and alighting of passengers at that point as safety requires. The petition of residents asking for a shelter at that crossing is denied. It was shown at the hearing on this matter that such a stop was formerly made commencing with the operation of the road and discontinued only a year ago. The company was incorporated as a street railway and although it now operates by steam the commission holds that it must be assumed to be operating a street railway. The nearest stop now made is at Buffalo street, Marion, nearly half a mile from the Mill street crossing.

COURT NEWS.

The attorney-general of Texas has filed suit for \$5,000 penalties against the Texas & New Orleans for alleged violations of the State Railway Commission's lumber tariff. It is charged that the road collected 6 cents per 100 lbs. for the transportation of lumber from Voth to Port Arthur when the commission's rate was 3½ cents. The railway's defense is that the shipment was to be hauled by water beyond Port Arthur and that, therefore, the shipment was interstate.

The Oregon Trunk Line Railway, which is reported to be a Hill enterprise, on September 24 won a contest in the United States district court at Portland against the Deschutes Railway for 60 miles of right-of-way in the Deschutes canyon in Central Oregon. Representatives of the Deschutes Railway were forbidden to go on the contested right-of-way. Counsel for the Deschutes road asked that representatives of the Oregon Trunk Line also be forbidden to go upon the right-of-way while the litigation is pending, but the court refused to make such an order.

The finding of the auditor in the case of the income bondholders of the Central of Georgia has been sustained by the Superior Court. According to the finding of the auditor, the third income bonds [and therefore the second and first income bonds] are entitled to interest in 1907 and should properly share in the earnings of the Ocean Steamship Co., the stock of which is owned by the Central of Georgia. In 1907 and 1908 the company claimed the right to use the surplus earnings of the steamship company for betterment to its property, but in the fiscal year ended June 30, 1909, the Central of Georgia received dividend of \$10 per share on the stock of the Ocean Steamship Co.

Section 1, Article 15, of the Washington constitution provides that none of the state harbor areas shall be sold or granted by the state or its right to control the same relinquished, but such areas shall be forever reserved for landings, wharves, streets and other conveniences of navigation and commerce. The state laws which grant railways the right to condemn property for railway use also, the newspaper despatches say, specifically exempt state harbor area. The Puget Sound & Grays Harbor, a Harriman line to Grays Harbor, brought suit in the superior court of Chehalis county to condemn the right-of-way across the tide land owned by I. Hulme. The superior court decided in favor of the railway and the case was appealed to the supreme court. Hulme defended the case on the ground that the proposed right-of-way crossed harbor area on leaving his premises, and as the constitution and laws prohibited railway rights-of-way on harbor areas there was no necessity for condemning his property because without encroaching on the harbor area the road could never be built. He also contended that the company could not build because it had not proved, as the law requires, that its entire capital stock was subscribed before it began the suit. The supreme court ruled in favor of Hulme on the second point and remanded the case for a new trial in which the railway must prove that its stock was all subscribed before the suit was brought. Ruling on the first point, the court said that the constitution was framed in pioneer days and that its framers, not realizing the remarkable development that would take place in the state, could not have intended their language to be understood in the narrow and restricted sense heretofore accepted, and held that railways may secure rights-of-way across state harbor areas. Five of the justices of the supreme court subscribed to the majority opinion and four filed a dissenting opinion.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JUNE, 1909. (See also issues of Aug. 6, 13, 20, and 27.)

Main table with columns: Name of road, Mileage operated at end of period, Operating revenues (Freight, Passenger, Inc. misc., Total), Maintenance of way and structures, Traffic, Trans- portation, General, Total, Net operating revenues, Outside operations, Taxes, Operating income (or loss), Increase (or dec.) comp. with last year.

(+) Credit. * Deficit. † Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. R. Dillon, second vice-president and general manager of the Gulf & Interstate at Galveston, Tex., has resigned.*

The office of J. T. Wellock, auditor of the Cleveland, Akron & Columbus, has been transferred from Cleveland, Ohio, to Akron, Ohio.

M. Fitzgerald has been appointed auditor of the Idaho Northern Railroad, with office at Enaville, Idaho, succeeding A. Wyman, transferred.

Thomas Cooper, land commissioner of the Northern Pacific at St. Paul, Minn., has been appointed also assistant to the president, with office at St. Paul.

E. M. Reynolds has been appointed comptroller of the Lehigh Coal & Navigation Co. and subsidiary companies, and Edward Hughes has been appointed auditor, both with offices at Philadelphia, Pa.

The officers of the Chicago Great Western are now as follows: S. M. Felton, president; Joseph W. Blabon, vice-president in charge of traffic; John B. Payne, general counsel; J. W. Newlean, auditor; R. O. Barnard, treasurer, and G. F. Philleo, secretary.

Operating Officers.

The office of W. S. Melton, superintendent of telegraph of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern, has been transferred from Lexington, Ky., to Danville, Ky.

C. G. Bowker, trainmaster of the Grand Trunk at Stratford, Ont., has been appointed a superintendent, with office at London, Ont. J. A. McLardy, trainmaster of the Wabash at St. Thomas, succeeds Mr. Bowker, with office at Stratford.

G. H. Groce, superintendent of telegraph and signals of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, has been appointed assistant to the general manager of these lines, with office at Chicago. F. T. Wilbur, assistant superintendent of telegraph at Chicago, has been appointed superintendent of telegraph of the Illinois Central lines north of the Ohio river and of the Indianapolis Southern, with office at Chicago, and B. Weeks, assistant superintendent of telegraph at Memphis, Tenn., has been appointed superintendent of telegraph of the Illinois Central lines south of the Ohio river and of the Yazoo & Mississippi Valley, with office at Memphis. The offices of the superintendent of telegraph and signals and of the assistant superintendents of telegraph have been abolished.

Traffic Officers.

L. L. Shields has been appointed a traveling freight agent of the Central of Georgia, with office at Cincinnati, Ohio.

Sid B. Jones has been appointed a traveling freight agent of the Louisville & Nashville, with office at Birmingham, Ala.

Albert J. Wyant has been appointed a traveling freight agent of the Chicago, Peoria & St. Louis, with office at Pittsburgh, Pa.

H. O. Post has been appointed a district passenger agent of the Chicago Great Western, with office at Des Moines, Iowa, succeeding T. H. Camp, promoted.

C. W. Taggart has been appointed acting general freight and passenger agent of the Chicago Terminal Transfer, with office at Chicago, succeeding W. B. Barr, resigned.

I. M. Griffin, general agent of the International & Great Northern at Galveston, Tex., has been appointed to the new position of general cotton agent at Palestine, Tex.

Frank Roberts has been appointed general passenger agent of the United Railways of Havana, also of the connecting railways and steamship lines, with office at Havana, Cuba.

Frank Koch, chief clerk to the general freight agent of the International & Great Northern at Palestine, Tex., has been appointed an assistant general freight agent, with office at Palestine.

A. J. Keefe has been appointed a traveling freight agent of

the Boston & Albany, with office at Springfield, Mass., and will also represent the Merchants Despatch fast freight lines, succeeding S. W. Carder, who has been appointed private secretary to the general manager of the New York Central fast freight lines at Buffalo, N. Y.

Engineering and Rolling Stock Officers.

F. E. Patton has been appointed a road foreman of engines of the Mobile & Ohio, with office at Mobile, Ala.

James C. Fritts, foreman at the Hoboken, N. J., shops of the Delaware, Lackawanna & Western, has been appointed master car builder, with office at Scranton, Pa., succeeding Robert F. McKenna, resigned.

J. Barrydale has been appointed assistant superintendent of the car department of the Illinois Central, and A. J. McKillop has been appointed the assistant superintendent of machinery in charge of locomotives, both with office at Chicago.

A. F. Stotler has been appointed a division engineer of the Oregon Railroad & Navigation Company, with office at Portland, Ore., succeeding C. C. Berkeley, resigned. C. C. Blood has been appointed a division engineer of the Southern Pacific Lines in Oregon, succeeding W. Bollons, assigned to other duties.

Special Officers.

D. C. Buell has been appointed chief of the educational bureau of information of the Union Pacific, and G. W. Seiver has been appointed assistant chief, both with offices at Omaha, Neb.

A. Slagle has been appointed assistant general land and immigration agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo., succeeding J. P. Licklider, resigned to go into other business.

Charles J. Bour has been appointed superintendent of station advertising of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago. He will have jurisdiction over all station and right-of-way advertising and vending machines and will report to the president.

Purchasing Officers.

The office of general storekeeper on the Buffalo, Rochester & Pittsburgh has been abolished and reports previously made to the general storekeeper will in future be made to the superintendent of motive power.

OBITUARY.

J. A. Heether, superintendent of the Southern Railway, with office at Memphis, Tenn., died at Atlantic City, N. J., on August 29.

LaFayette Briggs, manager of the Traders Despatch, with office at Chicago, died at Hinsdale, Ill., on August 27, at the age of 48 years.

Captain John Francis Divine, assistant general superintendent of the Atlantic Coast Line, died at his home in Wilmington, N. C., on August 21, after an illness of about a year. Mr. Divine was born in Glasgow, Scotland, June 27, 1830. He went to Wilmington in September, 1851, to superintend the erection of a number of locomotives for the Wilmington & Raleigh, known as the Wilmington & Weldon, which is now part of the Atlantic Coast Line. In 1865 he was appointed master mechanic of the Wilmington & Weldon and remained in that position until his appointment as general superintendent in 1872. He eventually became the general superintendent of the entire system of the Atlantic Coast Line, and held that position until a few years ago, when he was relieved of a part of his duties on account of declining health, and was given the position of assistant general superintendent, which he held up to the time of his death. Mr. Divine was in the employ of the companies that form the present Atlantic Coast Line for 58 continuous years, with the exception of the four years he was in the Confederate army during the Civil war. He was one of the oldest members of the Master Car Builders Association and until the last few years had been a regular attendant at its meetings. He was also one of the oldest of the Atlantic Coast Line officials, and that system was expanded and extended largely through the co-operation of Mr. Divine.

Railroad Construction.

New Incorporations, Surveys, Etc.

ARIZONA & CALIFORNIA.—See Atchison, Topeka & Santa Fe.

ATCHISON, TOPEKA & SANTA FE.—An officer writes that it is expected to begin grading work about September 15 on the remaining 90 miles of the Arizona & California to finish this line from the bridge over the Colorado river near Parker, Ariz., west to Bengal, Cal. (Aug. 20, p. 339.)

An officer writes regarding the reports that this company will build a cut-off in Oklahoma that the company at the present time has not under consideration any new lines in Oklahoma, and probably will not build any lines until the state of Oklahoma makes it possible by changes in its laws.

CANADIAN NORTHERN QUEBEC.—The new line from Garneau Junction, Quebec, to Quebec, 76 miles, has been finished and regular trains are now in operation.

CANADIAN PACIFIC.—Regarding the recent reports that a line is to be built to Puget Sound, an officer is quoted as saying that there is no intention of building as long as the present tariff agreement with the Northern Pacific proves profitable. It is the policy of the company to develop Canadian territory and not to invade the United States.

CHICAGO & NORTH WESTERN.—The Sioux City, Dakota & North Western has been incorporated in Iowa with \$600,000 capital and offices at Des Moines. The plans call for a line from Sioux City, Iowa, north about 40 miles to Hawarden. This is understood to be a Chicago & North Western project. M. Hughitt and J. M. Whitman, of Chicago; W. A. Gardner and R. H. Aishton, of Evanston, and J. F. Cleveland, of Oak Park, are interested.

CRYSTAL CITY & UVALDE.—An officer writes that a grading contract has been let to J. A. Andrews & Son, of Beaumont, Tex., for work on this line from Uvalde south to Crystal City, 42 miles. The line is now in operation on 12 miles from Uvalde to the Nueces river and work is under way on a steel bridge over that river. A. R. Ponder, chief engineer, Crystal City.

CUYANA RANGE LINE.—An officer writes that a contract has been let recently to Dahl & Baumgarten to build a spur line. This improvement will shorten the line about two miles east of Deer Wood, Minn., to Rabbit Lake mine. The main line runs from Deer Wood southwest via section 30 to Brainerd. An extension is projected from Deer Wood east to Duluth, about 125 miles. Cuyler Adams, president and general manager, Deer Wood. (April 16, p. 871.)

DELAWARE & EASTERN.—Contracts are to be let soon for building an extension of this line from Margaretville, near Arkville, N. Y., northeast to Schenectady, 63 miles, with a spur from South Schenectady northwest to a connection with the Boston & Maine at Rotterdam Junction, six miles. (Aug. 6, p. 258.)

FORT DODGE, DES MOINES & SOUTHERN INTERURBAN.—According to press reports this company is planning to build an extension from Boone, Iowa, north to Webster City. Negotiations are pending for the purchase of the Crooked Creek Railroad, operating a road from Webster City southwest to Lehigh, 17 miles, and to electrify this line, also to build an extension from Brushy to the present line between Boone and Fort Dodge. If these negotiations are successful the extension from Boone to Webster City will not be built for some time.

HUDSON & MANHATTAN.—Announcement is made that the extension to Thirty-third street, in the Borough of Manhattan, will be opened for operation in May, 1910. The work has been finished to Twenty-seventh street and the station at Twenty-eighth street will be ready in a few months, but the line will not be opened until the Thirty-third street station is finished. Plans are being made for the extension to the Grand Central station, and as soon as the necessary consents of property owners are obtained and the plans approved by the Public Service Commission the work will be started.

INDIANA ROADS.—Wallace B. Campbell, of Anderson, Ind.,

has been granted a number of franchises and is back of a project to build an electric line from Anderson west via Noblesville to Lebanon, 45 miles.

KANKAKEE & URBANA TRACTION.—Incorporated in Illinois, with \$200,000 capital and office at Kankakee. The plans call for lines as follows: From Kankakee south to Urbana, through the counties of Kankakee, Iroquois, Ford and Champaign; from a point in Champaign county south through Douglas and Coles counties to Charleston; from a point near the county line between Kankakee and Iroquois southwest to the village of Piper City, in all about 165 miles. The incorporators and directors include: R. F. Cummings, G. M. Bennett, I. N. Palmer, W. J. West, C. E. Thrasher, F. J. Hennessy, U. Schaub, W. J. Brock and W. D. Moore, Jr.

MEXICO NORTHWESTERN.—An officer writes that this company has taken over the property and lines in Mexico of the Chihuahua & Pacific, operating 178 miles from Tabalaopa Junction west to Temosachic; the Rio Grande, Sierra Madre & Pacific, operating 156 miles from El Paso, Tex., southwest to Terrazas; the Sierra Madre & Pacific, in operation from Temosachic north to Madera, 32 miles, and its Madera-Bacerac branch, of which 18 miles are built. Surveyors are now locating a line to be built from Terrazas south to Madera, and are also locating the route for a proposed extension from a point on the existing line, southwest, to a connection with the Southern Pacific and probably through to the Pacific coast. E. N. Brown, president of the National Railway of Mexico, is a director. F. S. Pearson is president. (Aug. 13, p. 297.)

MISSISSIPPI VALLEY INTURBAN.—Work is to be started at once on an extension from Rochester, Ill., south via Pawnee to Hillsboro, about 50 miles, where the company already has several miles of track in operation.

MISSOURI, OKLAHOMA & GULF.—An officer writes that work is now under way by J. W. Hoffman & Co., of Calvin, Okla., building an extension from the present southern terminus at Calvin south to Dennison, Tex. The work will include two steel bridges. (Aug. 13, p. 297.)

MISSOURI RIVER & NORTHERN.—Incorporated in South Dakota, with \$1,000,000 capital and office at Gannvalley, S. Dak. The plans call for about 100 miles of line from Platte, in Charles Mix county, north through Brule, Buffalo and Hand counties to Orient, in Faulk county. The incorporators include: W. O. Crockett, J. E. Ziebach, J. E. Ingerson, of Gannvalley; J. Q. Anderson, of Chamberlain, and J. B. Ross, of Miller.

NEW YORK CENTRAL & HUDSON RIVER.—An officer writes that a contract was recently let to the Walsh-Kahl Construction Co. and improvements are now under way on about five miles of line near Niskayuna, N. Y. The work consists of raising a section of the tracks and relocating part of the line to avoid inundation, due to the construction of the state barge canal and of dams at Niskayuna and at Crescent.

Work on the Gardenville yard, which was begun several years ago and suspended when about half finished, an officer writes, will probably be resumed in the near future.

NORTH COAST.—Contract is said to have been let to Washtock & Chew, of Spokane, Wash., for 10 miles of rock work on the Spokane-Tekoa section, to cost about \$400,000. The work is from a point about five miles southeast of Spokane, above the confluence of the Marshall and Hangman creeks east. On this section there will be five tunnels, aggregating about a mile, to be pierced through solid rock. (Aug. 20, p. 339.)

OREGON TRUNK LINE.—According to press reports from Oregon this company is planning to build an extension of the line now under construction to Madras, in central Oregon, southwest via Eugene to Coss bay, on the Pacific coast, about 200 miles from Madras. (Aug. 27, p. 385.)

PACIFIC, GULF & YUCATAN.—See Pan-American.

PAN-AMERICAN.—J. M. Kneeland, vice-president and general manager, holds a concession from the Mexican government to build from a point on the Pan-American at Jalisco northeast to Campeche, 350 miles. According to reports financial backing has been secured and plans are being made to start the work. The Pacific, Gulf & Yucatan was organized to carry out this work. (March 19, p. 661.)

PORT ARTHUR TRACTION.—An officer writes that contracts have been given to H. E. Talbott for building seven miles of interurban line near Port Arthur, Tex. Additional contracts are shortly to be let. H. J. Myers, president and general manager and H. E. Talbott, chief engineer, Dayton, Ohio.

PROVIDENT RAILWAY RIGHT-OF-WAY CO.—An officer writes that surveys are now being made and bids are wanted September 15 to build from Glen Flora, in Wharton county, Tex., west via Provident City, to Hallettsville, in Lavaca county, 55 miles. There will be one steel bridge and four trestles. Carey Shaw, president, 2700 Fannin street, Houston. (See Texas Roads, Aug. 27, p. 383.)

ST. LOUIS & SAN FRANCISCO.—An officer writes regarding improvements being made at Marion, Ark., that the company is building yards, increasing its mechanical facilities, putting up a roundhouse, a storehouse, some other buildings and a cinder pit. A connecting line is being built to the Chicago, Rock Island & Pacific at an estimated cost of \$300,000. (Aug. 27, p. 383.)

ST. LOUIS, BROWNSVILLE & MEXICO.—According to press reports a contract has been entered into between this company and the Calhoun Cattle Co. to build 39 miles of line from Bloomington, in Victoria county, Tex., south to Port O'Connor, on the gulf. (March 19, p. 657.)

SIoux CITY, DAKOTA & NORTH WESTERN.—See Chicago & North Western.

STATESVILLE AIR LINE.—An officer writes that this company proposes to build from Statesville, N. C., north to Mountairy, in Surry county, about 64 miles, thence to Rodford, Va., an additional 65 miles. The first section to be built will be from Statesville, via Harmony and Yadkinville to Boonville, in Yadkin county, 42 miles. M. D. Turner, president, Statesville.

TEXAS SOUTHEASTERN.—See this company under Railroad Financial News.

VEBLEN & NORTHWESTERN.—A mortgage has been given to the St. Louis Union Trust Co. to secure an issue of bonds to build the projected line from Aberdeen, S. Dak., east to Barrott, Minn., of which the first 40 miles is to be built at once. A. H. Dahl, president; H. P. Taussig, vice-president; A. Munson, secretary. M. J. Hawley, of Brandt, S. Dak., may be addressed. (July 23, p. 169.)

WASHINGTON TRACTION.—Organized in the state of Washington, with \$5,000,000 capital, to build 142 miles, for which surveys are finished. The proposed route is from Dayton, Wash., southwest via Waitsburg to Walla Walla, thence west to Wallula, thence northwest to Pasco. It is said that work is to be started about October 1, also that the company intends eventually to extend the line east 50 miles to Lewiston, Idaho. Gilbert Hunt, president, Walla Walla; W. H. Richardson, vice-president, Dayton; B. C. Holt, secretary; J. B. Catron, treasurer, and J. C. Armstrong, general manager, all of Walla Walla.

WESTERN ALLEGHENY.—According to press reports it has been decided that new shops and yards are to be located at Queen Junction, Pa., where connection is made with the Bessemer & Lake Erie. It is also announced that work will be begun soon on an extension from Kaylor, Pa., northeast to Reidsburg, 16 miles, where connection is to be made with the Franklin & Clearfield. Surveys for the new line have been made and plans are ready for putting up a bridge over the Allegheny river near East Brady. It is understood that contracts for work on the new line will be let soon. There will be a large number of cuts, fills, tunnels and bridges on the line.

WYOMING ROADS.—According to press reports a company is being organized by New York, Pittsburgh and Wyoming capitalists to build through northern and central Wyoming. Surveys are said to have been finished from Buffalo, Johnson county, south to the Platt river, thence east to Orin Junction, about 150 miles, and from Buffalo north via Clearmont into Montana, 106 miles. The first section to be built will be from Clearmont south to Buffalo, 30 miles. E. C. Lockwood, formerly of Denver, Colo., and now of New York, and Patrick Haley, owner of the Haley ranch, are interested.

Railroad Financial News.

ATLANTIC COAST LINE CO.—The directors of this holding company have declared a quarterly dividend of 2½ per cent. payable September 10 on the \$12,600,000 outstanding stock. The two quarterly dividends previously paid this year were each 2 per cent., and in 1908 the annual dividend rate was 8 per cent. and in 1907 and 1906, 10 per cent. yearly was paid.

BALTIMORE & OHIO.—The New York Public Service Commission, First district, has given its consent to the transfer to the Baltimore & Ohio of 227 shares of the capital stock of the Staten Island Railway. This will give the B. & O. all of the stock of the Staten Island Railway except the few shares necessarily held by officers. There are 14,000 shares of stock outstanding.

CENTRAL OF GEORGIA.—See an item in regard to this company in Court News.

CHICAGO & GULF.—See Mobile, Jackson & Kansas City.

MISSOURI PACIFIC.—Certificates of stock of the old company are being exchanged for certificates of stock of the new consolidated company.

MOBILE, JACKSON & KANSAS CITY.—The property of this company and of the Chicago & Gulf was sold on August 30 for \$3,200,000 for the two. The purchaser represents about 98 per cent. of the bondholders of the old company and securities of the new company, the New Orleans, Mobile & Chicago, will be exchanged for the outstanding stock and bonds of the two old companies. The bonds and floating indebtedness of the old companies amount to about \$10,500,000.

MONTANA, WYOMING & SOUTHERN.—W. C. Langley & Co., New York, are offering the unsold portion of \$900,000 first mortgage 5 per cent. bonds of 1909-1939 of the Montana, Wyoming & Southern at 97½. The present issue of bonds, limited to \$900,000, is a first lien on the property of the company, which includes 33 miles of line running from Bridger, Mont., to Bear Creek. It is provided in the mortgage that if control of the property is acquired by some other railway company through stock ownership or lease the bonds must be guaranteed, principal and interest, by the controlling company. The road forms, it is said, the only practicable outlet for the coal mined in the Bear Creek district.

NEW ORLEANS, MOBILE & CHICAGO.—See Mobile, Jackson & Kansas City.

PAN-AMERICAN.—Press despatches dated Mexico City say that D. E. Thompson, United States ambassador to Mexico, has acquired control for about \$10,000,000 of the Pan-American, which runs from Gamboa, Oax., Mex., to Mariscal, Guatemala, about 286 miles.

TEXAS SOUTHEASTERN.—This company has asked the Texas Railroad Commission for permission to issue \$400,000 bonds. The road runs from Diboll, Tex., to Vair, 10 miles, and from Blix to Lufkin, 10½ miles, with an extension being built from Vair.

FOREIGN RAILWAY NOTES.

The government railway from Santiago, Santo Domingo, to Moca is now in operation. Surveys have been completed for changing the route of the present railway from Puerto Plata to Santiago. The present line is a rack railway for part of the distance, while the new line will have no grade heavier than 2½ per cent.

In the House of Commons McKinnon Wood, replying to a question, announced that the British government had authorized the government at Hong Kong to advance to the Chinese government \$5,500,000 to repurchase the concession for the rebuilding of the Hankow-Canton Railway from the American-Belgian combination.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The *New York Central Lines* are in the market for 235 locomotives.

The *Crystal City & Uvalde*, Crystal City, Tex., is in the market for locomotives.

The *St. Louis & San Francisco* has ordered 20 Pacific locomotives from the Baldwin Locomotive Works.

The *Quincy Western*, Quincy, Cal., is in the market for one 37-ton Forney 0-4-4, 14-in. x 20-in. locomotive for immediate delivery.

The *Chicago, Rock Island & Pacific*, as mentioned in the *Railroad Age Gazette* last week, has ordered 50 locomotives from the American Locomotive Company. The locomotives are to be consolidation type and are for delivery in October and November.

The *Northern Pacific* has ordered 17 Pacific locomotives from the Baldwin Locomotive Works as previously reported in the *Railroad Age Gazette*. The total weight, including loaded tender, is 376,900 lbs., the tender having a capacity of 12 tons of coal and 7,000 gallons of water. The cylinders are 22 in. x 26 in., the drivers 69 in. in diameter and the working steam pressure 200 lbs.

CAR BUILDING.

The *Northern Pacific* is in the market for 20 coaches.

The *Northwestern Elevated*, Chicago, will buy 20 cars.

The *Toledo Railway & Light* is in the market for 10 cars.

The *Gilmore & Pittsburgh*, Pittsburgh, Pa., is in the market for 100 box cars.

The *Crystal City & Uvalde*, Crystal City, Tex., is in the market for cars.

The *Port Arthur Traction Co.*, Dayton, Ohio, is in the market for electric cars.

The *Northern Pacific* has ordered 93 passenger cars from the Pullman Co.

The *Fresno, Cal., Traction Company* is in the market for 10 double truck cars.

The *New Orleans & Northeastern* is in the market for from 100 to 200 freight cars.

The *Chicago, Milwaukee & St. Paul* is to build 1,500 forty-ton box cars at its own shops.

The *Great Northern* has ordered a number (understood to be about 86) postal and baggage cars and coaches from Barney & Smith.

The *Union Railroad* ordered the 400 steel underframe box cars mentioned in the *Railroad Age Gazette* of August 20 from the Pressed Steel Car Company.

The *Baltimore & Ohio*, reported in the *Railroad Age Gazette* of August 20 as being in the market for 1,000 box cars, has ordered this equipment from the Standard Steel Car Co.

The *Quincy Western*, Quincy, Cal., has bought two flat cars from the Atlantic Equipment Co., San Francisco, and is in the market for one combination passenger-baggage car for immediate delivery.

The *Atlantic Coast Line* is preparing plans for six 60-ft. steel underframe coaches and four 60-ft. steel underframe express cars. This equipment was mentioned in the *Railroad Age Gazette* of August 20.

The *Chicago, Burlington & Quincy* has ordered 500 fifty-ton all steel flat cars from the American Car & Foundry Co., as mentioned in the *Railroad Age Gazette* of August 20. These cars are to be 40 ft. long and 9 ft. wide.

The *Harriman Lines*, reported in the *Railroad Age Gazette*

of August 20 as being in the market for 75 all-steel coaches, 3 diners and 2 observation cars, have ordered this equipment from the Pullman Co. These cars are to be duplicates of those previously ordered, as reported in the *Railroad Age Gazette* of July 16.

The *Chicago, Rock Island & Pacific* has ordered 400 flat, 1,100 box, 500 coal and 50 caboose cars from the American Car & Foundry Co.; 1,000 box cars from the Western Steel Car & Foundry Co., and 500 furniture cars from the Standard Steel Car Co. This order includes the cars mentioned in the *Railroad Age Gazette* of August 20.

The *St. Louis & San Francisco* has ordered 500 coal, 250 flat and 150 caboose cars from the American Car & Foundry Co.; 1,000 coal cars from the Standard Steel Car Co., and 31 seventy-foot passenger cars. These are in addition to the previous order to the American Car & Foundry Co. The passenger cars are divided as follows: Five combination coach and cafe, 10 baggage, 3 mail and coach, 3 mail and baggage and 10 coaches.

IRON AND STEEL.

The *Quincy Western*, Quincy, Cal., is in the market for 400 tons of 45 or 50-lb. rails for immediate delivery.

The *Southern* has ordered 12,000 tons of rails and is reported in the market for 20,000 kegs of spikes.

The *New York, Westchester & Boston* has placed an order for structural steel with the American Bridge Company.

The *Chicago & North Western* has ordered 60,000 tons of rails from the Carnegie Steel Co. It has also ordered 210 tons of structural steel for signal towers.

The *Atchison, Topeka & Santa Fe* ordered 28,000 tons of the rails mentioned in the *Railroad Age Gazette* of August 27 from the Colorado Fuel & Iron Co. and the remainder from the Illinois Steel Co., as stated. The same company is about to close for 22,000 tons of tie plates, 12,000 tons of rail joints and 700 tons of bolts.

RAILROAD STRUCTURES.

BRONTE, TEX.—The Kansas City, Mexico & Orient is completing its bridge over the Colorado river. It will have 133 pile bents, of which 100 are now in place.

CENTRAL CITY, NEB.—The Union Pacific has let contracts for a \$25,000 station to be built of pressed brick with stone facing.

CHESTER, WASH.—The Washington State Railroad Commission has issued orders to the Oregon Railroad & Navigation Co. to erect shelter stations for passengers and freight at Chester, Hay, Lewiston Junction, Lowdens, Nine Mile and Atalia. The order includes the building of additional freight storage room at Touchet and numerous minor improvements to station buildings.

COBALT, ONT.—Contract has been given by the Temiskaming & Northern Ontario to S. F. Whitman, of Toronto, for building a brick passenger station, 148 ft. long and 32 ft. wide.

DONALDSONVILLE, LA.—The West Kentucky Coal Co. has completed a river-rail freight transfer station with a capacity of 2,000 tons of freight per day. The opening of the station on August 26 was made a holiday. A number of prominent men were present and made addresses.

DULUTH, MINN.—An officer of the Minneapolis, St. Paul & Sault Ste. Marie writes that work was started 10 days ago by F. H. Lounsbury on a four-story concrete and brick, with terra-cotta trimming, passenger station. The new station is to be built on Michigan street, Duluth, and cost \$100,000. (Aug. 27, p. 388.)

EVANSVILLE, IND.—Plans are said to be under way by the Evansville & Terre Haute for putting up a large roundhouse.

GUADALAJARA, MEX.—The National Railways of Mexico is completing a shop 65 ft. x 160 ft. The improvements cost about \$12,000.

HIGH BRIDGE, KY.—Referring to the new bridge mentioned in the *Railroad Age Gazette* of August 27, an officer of the

Supply Trade News.

Cincinnati, New Orleans & Texas Pacific writes that it is to be built on the same line as the old one, using the same river piers, but that the grade of the track is to be raised almost 31 ft., necessitating the construction of new approaches at both ends. Contracts for the grading have been let to the Mason-Hanger Co., of Richmond, Ky., and Oliver Bros. & Honeycutt, of Knoxville, Tenn. The approaches will be built by the railway, which is also handling the placing of about 3,000 cu. yds. of concrete in extensions of the old piers. The new bridge is being designed by Gustav Lindenthal, of New York, and will be erected under his supervision.

LAUREL, MONT.—According to local press reports Tunnel No. 1 on the Great Northern, about 11 miles from Laurel, was burned out on August 23. The fire was started by engine sparks at a point near the middle of the tunnel and more than 1,000 ft. from either portal. At last reports it was feared the entire lining would be destroyed.

LOUISVILLE, KY.—An officer of the Illinois Central writes that the union station at Seventh and River streets, in Louisville, owned and used jointly by the Southern Railway, the Chesapeake & Ohio, the Cleveland, Cincinnati, Chicago & St. Louis and the Baltimore & Ohio Southwestern railways, was partially destroyed by fire several months ago. It is now proposed to rebuild and remodel the station, changing the floor levels, providing more room for offices, rearranging the waiting rooms and construct new baggage facilities. The work is to be started at once. (Aug. 20, p. 339.)

MARION, ARK.—See St. Louis & San Francisco under Railroad Construction.

MUSKOGEE, OKLA.—The Missouri, Kansas & Texas will build a freight house 50 ft. x 300 ft.

NATCHEZ, MISS.—The Yazoo & Mississippi Valley will build a passenger station to cost \$30,000.

OAKLAND, CAL.—An officer of the Southern Pacific is quoted as saying that the company has decided to build a more elaborate station at Sixteenth street, in Oakland, than was at first planned. New plans are to be made for a structure to cost \$200,000. (April 30, p. 963.)

PORTLAND, ORE.—According to press reports the Harriman Lines will put up the new bridge to replace the present steel structure over the Willamette river at a cost of \$1,300,000. The plans have been submitted to the War Department and to the Portland Commission for approval. The structure is to be 32 ft. wide and 1,300 ft. long, and is to have two decks, with a 220-ft. draw, and is to be 84.5 ft. above low water. (Jan. 8, p. 91.)

TALLADEGA, ALA.—The Atlanta, Birmingham & Atlantic is to build a concrete passenger station.

TANEHA, OKLA.—An officer of the Frisco system writes that stations are now being built at Taneha and Spaulding, Okla., and that work is to begin in the near future on stations at White Oak and Schuller, Okla.

VELASCO, TEX.—The Houston & Brazos Valley will build a station at Velasco.

WEST MARION, ARK.—The St. Louis & San Francisco, it is reported, will build a six-stall roundhouse, 75-ft. turntable, 120-ft. concrete cinder pit and a transfer table with 50-ton crane. Contract for this work is said to have been let to the Vulcan Construction Company of St. Louis.

Earnings of Paris City Railway.

Of the Paris City Railway (underground), part of which was first opened in 1900, the history may be summarized in the following table:

Year.	Miles open.	Millions carried.	Earnings, per mile.	Per cent. of expense.
1901.....	8.3	48.4	\$40,480	47.15
1904.....	16.2	100.6	62,032	.....
1908.....	30.1	229.7	65,818	42.20

The percentage of gross earnings absorbed by working expenses has varied little since the first year: 41.52 in 1902, 43.34 in 1905 and 42.02 in 1908.

The St. Louis & San Francisco is in the market for three 15-ton coal hoisting machines and three 100-ton wrecking cranes.

The American Locomotive Co. is expected to place an order in a few days for 39 cranes ranging in capacity up to 120 tons for use in its new shops at Dunkirk.

The Vulcan Iron Works, Wilkesbarre, Pa., are now building a 12-in. x 16-in. saddle tank switching locomotive for the New Castle Portland Cement Co., New Castle, Pa.

Grip nuts manufactured by the Grip Nut Company, Chicago, are to be applied on the 1,800 box cars for the Northern Pacific, which are to be built by the Pullman company.

The Bucyrus Company, South Milwaukee, Wis., lately sold a 100-ton wrecking crane to the Baltimore & Ohio and a locomotive pile driver to the Chicago, Burlington & Quincy.

The J. H. Flick Construction Co. has removed its general offices from Mt. Vernon, N. Y., to 275 Old Colony building, Chicago. The company is engaged in a general railway contracting business, and this move is made to facilitate the handling of a larger volume of western business.

John G. Osgood, formerly manager of sales in the Chicago office of the Chicago Pneumatic Tool Co., has been promoted to general sales agent, and instead of confining himself to the general offices will in the future visit all the larger users of pneumatic tools and appliances. Charles Booth, vice-president and general manager, will perform the duties heretofore performed by Mr. Osgood.

All arrangements have been perfected for opening up a permanent sample exhibiton at Berlin in the spring of 1910. This exhibition is designed primarily as an exhibit of distinctively American products. The German committee will advertise the exposition throughout the continent and will co-operate with American manufacturers and exporters in every way to popularize and exploit American products. The address of the American committee is American Exhibition Co., 77 Broad street, New York.

The Dodge Mutual Relief Association, which is composed of employees of the Dodge Manufacturing Company, Mishawaka, Ind., celebrated its twentieth anniversary on July 31. The association's object is to give aid to its members in cases of disability arising from sickness or accident when sufficient to unfit them for work. In case of death a benefit is paid to the family or heirs. All of the 2,000 employees of the Dodge Manufacturing Company are members of the association, which has disbursed \$15,000 since its establishment.

The Armstrong Spark-Arrester Co., Cincinnati and Boston, was recently incorporated, as mentioned in the *Railroad Age Gazette* of June 25. The officers of the company are: Albion F. McCarthy, president; Carter C. Armstrong, vice-president, and William C. Armstrong, secretary and treasurer. The company makes a spark arrester which has been in service on the Carrollton & Worthville R. R. at Carrollton, Ky., for a year, during which the road has never had a fire on its right-of-way due to sparks from a locomotive. It is claimed that the arrester is simple in principle and does not affect the steaming of the locomotive. It consists of a small inner stack with a deflecting plate over the top which deflects and carries off the sparks into an outer channel and from there into a box alongside the steam chest or under the locomotive if preferred.

Announcement is made of the appointment of Charles D. Jenks as western sales manager of the Standard Coupler Company, New York, by Mr. George A. Post, president. The western sales office of the company is at room 1207 Fisher building, Chicago. Mr. Jenks has been connected with the Pressed Steel Car Company for the past seven years—two years in the operating department as assistant to the vice-president in Pittsburgh, and five years in the sales department in Chicago. Prior to his connection with the Pressed Steel Car Company

Mr. Jenks was for eight years employed in the traffic department of the Pennsylvania and for six years he was with the engineering and construction department of the Atlantic Refining Company in Philadelphia. Mr. Jenks enjoys a wide acquaintance with railway officers and supply men, by whom he is highly regarded.

The committee on arrangements of the Car Lighting Supply Manufacturers Association desires to learn as early as possible what will be the requirements for space for exhibits in connection with the annual meeting of the Car Lighting Engineers Association at the La Salle Hotel, Chicago, October 4 to 6. The Car Lighting Engineers Association requests that as many manufacturers as possible exhibit at this convention so that the members connected with railways may become better acquainted with the different products used in car lighting. That ample space may be provided it is necessary that the committee on arrangements know at once the amount of space desired by each exhibitor. It therefore requests each manufacturer to advise J. M. Schilling, chairman, of the approximate number of square feet of floor and wall space which will be needed by him, enclosing a rough sketch of the shape in which the space is desired. As the floors of the exhibit rooms are tiled it will be impossible to attach anything to them, as well as to the walls. The exhibition will be on the second floor of the La Salle hotel, which will sustain any reasonable weight. The exhibitors will be supplied free of charge with steam and direct current electricity, but construction work and installation will be at the expense of individual exhibitors. The exhibit space will be composed of a series of connecting private dining rooms varying in size from 14 ft. x 16 ft. to 16½ ft. x 27 ft. Applications for exhibit space should be addressed to J. M. Schilling, chairman committee on arrangements, 1420 New York Life building, Chicago.

TRADE PUBLICATIONS.

Burlington Route.—The passenger department of the Burlington has issued a folder on the service and fares to be in effect during the period of colonist rates, September 15 to October 15.

Fan Motors.—Booklet No. 3,839, recently issued by the General Electric Co., Schenectady, N. Y., describes, with illustrations, some 8-in. four-blade fans and 12-in. six-blade fans for both alternating and direct current.

Hydraulic Tools.—Catalogue No. 73 of the Watson-Stillman Co., New York, describes a complete line of hydraulic tools for steam and electric railway service. Many of the tools have not previously been described. The catalogue has 120 pages and is fully illustrated.

Hudson-Fulton Celebration.—The New York Central is distributing a pamphlet giving the programme of the coming Hudson-Fulton celebration at New York. The programme extends from September 25 to October 9. The pamphlet is well illustrated and relates briefly the story of Henry Hudson and of Robert Fulton.

Tungsten Lamps.—Bulletin No. 4,680 of the General Electric Co., Schenectady, N. Y., discusses the use of tungsten lamps for interior and exterior lighting, particularly sign lighting. A small folder gives details of the 40-watt G. E. tungsten lamp, including life average saving, etc. Another recent pamphlet is entitled "Tungsten Lamp Logic."

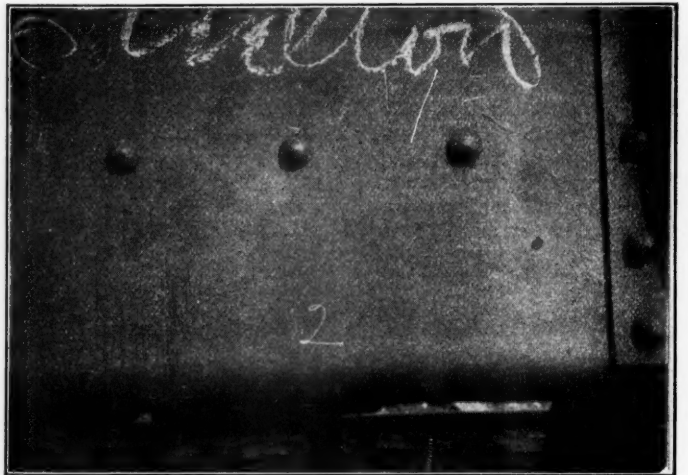
Asbestos Protected Metal.—A 32-page pamphlet has been published by the Asbestos Protected Metal Co., Canton, Mass., in which its product is fully described and numerous illustrations of buildings using the asbestos-protected metal are given. The Robertson standard roof for box and refrigerator cars manufactured from Aspromet brand asbestos protected metal is illustrated and described.

"Fertile Lands of Colorado."—This publication by the Denver & Rio Grande has been issued yearly for the last 12 years and, in its increasing size, has followed the growth of the agricultural resources of that state until the most recent edition contains 85 pages of small print. The information is well arranged and indexed for use in referring to the numerous and widely-differing farming regions in Colorado and northern New Mexico.

Tungsten Lamps.—The Western Electric Company, New York and Chicago, is distributing a bulletin illustrating and exploiting the Sunbeam Tungsten miniature lamp for use on voltages between 1½ and 20. These lamps vary in efficiency from 0.9 watts per c.p. to 1.33 watts per c.p., and are particularly desirable for use in automobiles, flash-lights, signs, dental, optical and surgical instruments, and in fact any place where battery or low voltage power circuit lamps are used. A copy of this bulletin No. 8-A may be obtained from the Western Electric Company's nearest house.

The Durability of Silica-Graphite Paint.

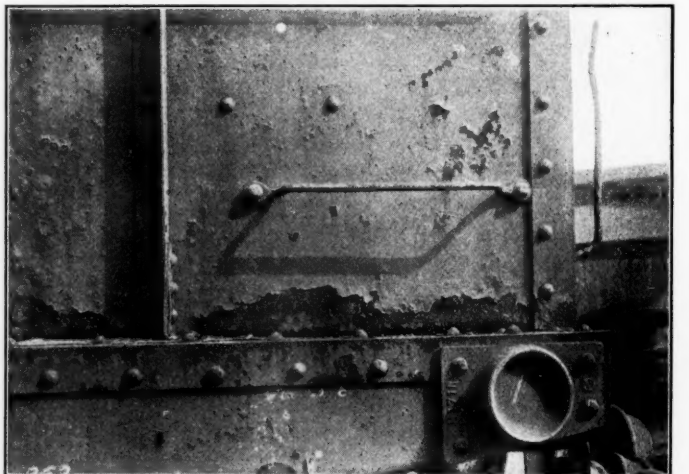
It is well known that almost any mixture of oil and powdered solids can be used as a paint and that it will present a fairly attractive surface when fresh. But the condition of that surface after it has been exposed for a time to the weather will depend entirely upon



Car Painted With Dixon Crucible Silicon Paint.

the composition of the oil and the pigments. If the latter are such that they will form chemical compounds with the other substances with which they are apt to come into contact, the life of the paint will be short, or if the vehicle does not possess firmly adhesive properties or dries into a hard scale instead of a soft and elastic film, then cracking and scaling off will soon appear, and with the first crack through the skin the paint on a metal surface is doomed, for rust will immediately set in and it is merely a matter of a short time before things will look badly.

In the accompanying illustration the surfaces of two cars are shown that are of the same type and were in service for the same



Car Painted With Ordinary Paint.

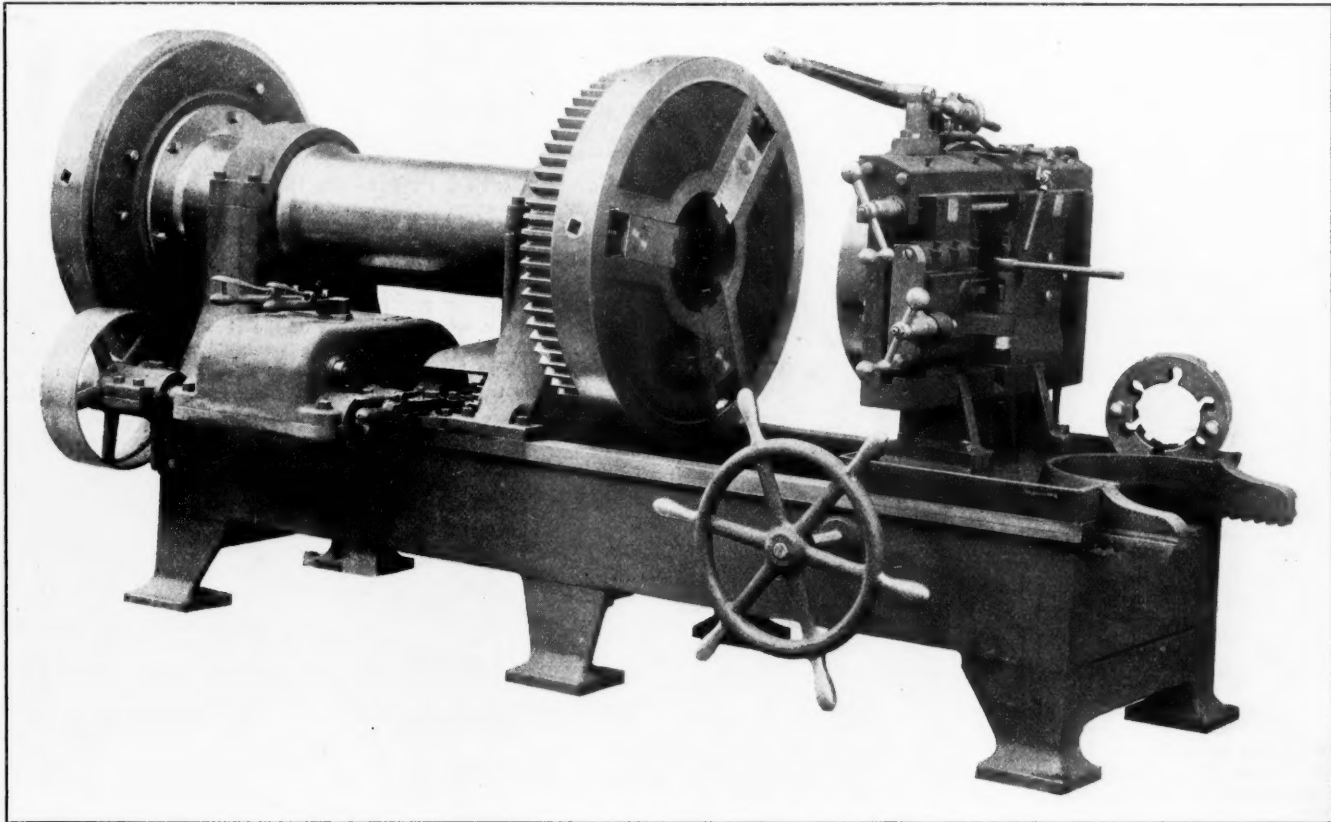
length of time on the same road, carrying the same class of lading. The time elapsed since the last painting was 18 months in each case, and both are fair average examples of the cars which they represent. One was painted with a cheap, common red paint that had scaled off in large patches over the whole of the surface of the sides and ends, with the resultant appearance that is shown in the photograph. Rust

had made heavy inroads on the plates and the whole was in a condition of rapid deterioration.

The other photograph illustrates the appearance of the surface of a car that had been painted with the silica-graphite paint, made by the Joseph Dixon Crucible Co., Jersey City, N. J. It will be seen to be smooth and continuous throughout its whole extent, with no trace of rust or deterioration. A piece of the skin flaked off with a

are graduated and readily set to any particular size. The slides on the rear chuck have flange grippers in addition to the pipe grippers, for making up flanged work.

The speeds are obtained through the gear box and a compound sliding gear on one of the shafts. There are no racking gears or clutches. The gears in the box are made of steel and run in oil. A speed plate is attached to the box, showing how to obtain the speeds



Number 8 Duplex Pipe Machine.

knife was soft, flexible and closely adherent to the steel, showing that there was still much of life left in it and that it would probably be many months before the car would need repainting. As a comparison of methods of painting it is of interest and importance.

Pipe Threading and Cutting Machine.

The No. 8 Duplex pipe threading and cutting machine illustrated herewith will cut off and thread pipe or casing from 2½ in. to 8 in., inclusive. It is designed to withstand the severest strains of making up fittings, which requires more power and is harder on a machine than the cutting of threads.

The die head is of the low-down type, placing the handles and die lever within easy reach of the operator. It is equipped with the Peerless adjusting mechanism, which is simple to operate. The adjustments necessary to obtain threads of different gages are made by turning the adjusting nut. This nut is attached to the cam ring bracket by means of a swivel yoke. The adjusting screw passes through the nut and is connected to the die lever. Turning the nut in either direction revolves the cam ring, causing the dies to expand or contract. When the die lever is down, in position for threading, it is in a straight line with the adjusting screw, which means that the dies release with the first upward movement of the die lever. There can be no digging into the pipe. When the dies are to be removed from the head, the stop latch is thrown back, allowing the cam ring to revolve into such a position that the openings in the ring are opposite the slots in the die head. The dies can then be removed. This also permits the slots to be cleaned without removing the ring. The steady slides, which support the pipe when being cut off, have interchangeable hardened steel facings. On one of the slides is attached the cutting off device, which places the cutting off tool near the point of support. When it is desired to cut off pipe, the steady slides are closed on the pipe firmly and the cut-off tool is then brought into action. The reaming tool is held in a tool post on the cut-off slide, and is always in position.

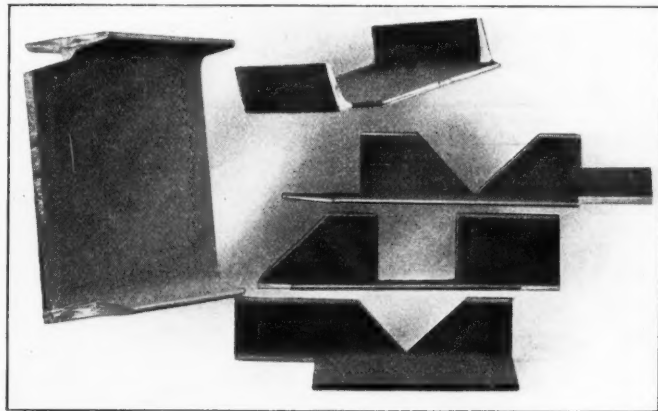
The chucks are of the independent type, each having three jaws. Tempered steel grippers are dovetailed into the ends of the slides, and can be removed and sharpened. The slides, which are made of steel,

for the various sizes of pipe. By using a single driving pulley, a constant belt speed is obtained. The oil pump supplies oil to the dies and cutting-off tool. It is direct connected, and is not driven by belt, which gives trouble from becoming saturated with oil. The countershaft has two self-oiling loose pulleys, for open and cross belt; one tight and one driving pulley.

The machine requires a 3-h.p. motor, and the extreme floor space occupied is 40 in. x 110 in. It is made by the Biznall & Keeler Manufacturing Co., Edwardsville, Ill.

Hydraulic Coping Machine.

The Watson-Stillman hydraulic coping machine is designed to reduce to a minimum the time, labor and power consumption in trimming structural shapes, small pieces of plate metal, bar iron, etc., in steel mills, shipbuilding plants, structural iron, boiler and loco-



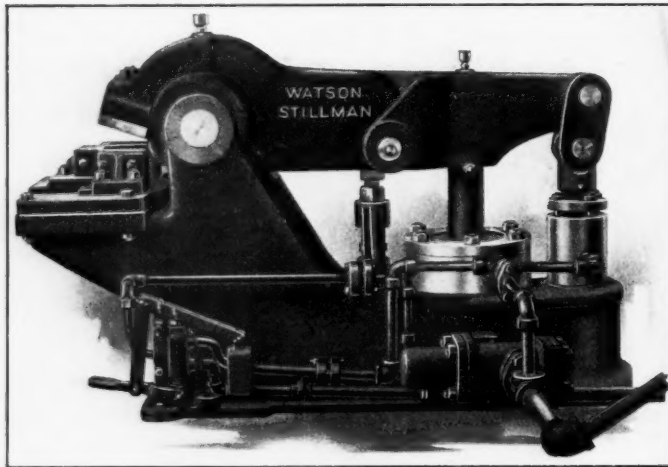
Cuts Made by Coping Machine.

motive shops and wherever splices, connections or cuts similar to those shown herewith must be made.

The machine consists of a heavy steel beam hydraulically operated from the rear to concentrate extreme power upon shearing knives in front. The forward end of this lever is so divided and constructed that by the removal of a pin the half containing the upper right hand knife may be thrown out of action and the knife left standing at its upper limit.

Pressure on the foot lever admits working pressure to the main cylinder. The upward movement of the ram, transmitted through the ball-ended connecting rod to the shearing beam, makes the moving knives travel to their lower limit. Releasing the foot lever permits the liquid to exhaust from the main cylinder and at the same time pressure is thrown onto the top of the piston in the pull back cylinder. This brings the shearing beam back to initial position.

The divided upper knife also permits the insertion of a web or flange when it is desired to shear close to those parts, and is very



Hydraulic Coping Machine.

handy in certain types of cuts, smaller than the combined area of both knives. The lower or stationary knives are bolted to the plates in such a manner that those on any side may be removed without disturbing the others.

This construction offers a large number of cutting combinations, and as the change can be made, it is said, from any one combination to another in less than one minute's time, the machine will be found very convenient in making cuts at odd angles.

The length of lever stroke is adjustable, being determined by the setting of a screw stop between the main bearing and the cylinder. It is thus possible to reduce the stroke so as to be most economical of power while a large number of similar cuts are being made.

The main cylinder is ordinarily built for a working pressure of 1,500 lbs. per square inch, but machines are furnished for any working pressure between 1,000 and 3,000 lbs. In shops where the line pressure is below these figures an intensifier may be employed to produce a suitable operating pressure.

The body of the machine is heavily ribbed along the lines of greatest stress. The diameter of main ram is 9 in.; stroke of main ram, 7½ in.; diameter of pull back piston, 3 in.; diameter of pull back cylinder, 4 in., and weight, 4,700 lbs.

The machine is made by the Watson-Stillman Co., New York.

Collett-Hosmer Railway Crossing.

The accompanying design for a railway crossing was worked out by A. Hosmer, of Fort Worth, Tex. The purpose of the inventor was to provide a strong, rigid crossing at reasonable cost, on which the

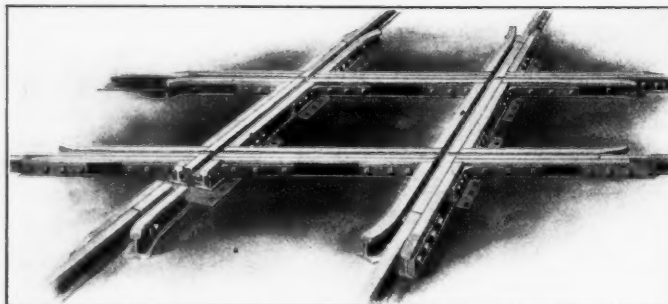


Fig. 1—Collett-Hosmer Railway Crossing.

maintenance expense would be minimized. It will be observed that a filler rail of special section is substituted for the through rail of present standard crossings. This filler rail has a broad body with a pair of ribs on each side which fit between the heads and flanges of the reinforcing and guard rails, doing away with the use of filling blocks.

The filler rails for one of the tracks are made continuous, and those for the intersecting track have their ends which abut the continuous filler rail shaped to fit closely into the recesses of the latter, as shown in sectional view, Fig. 2. The upper face of each of the

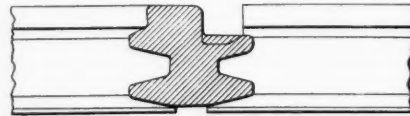


Fig. 2—Section at Intersecting Track.

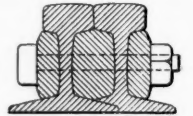


Fig. 3—Section at Crossing Rail.

filler rails is grooved out for the wheel flanges, but the broad body of these rails, supported by the heavy ends of the intersecting rails, provide a strength at this point which is almost entirely lacking in the usual crossing, where the heads of the through rails are cut away to provide a flangeway, making the weakest point of the crossing, and the one where breakages most often occur. Fig. 3 shows a section where the track rail joins the crossing rail, a short filling block

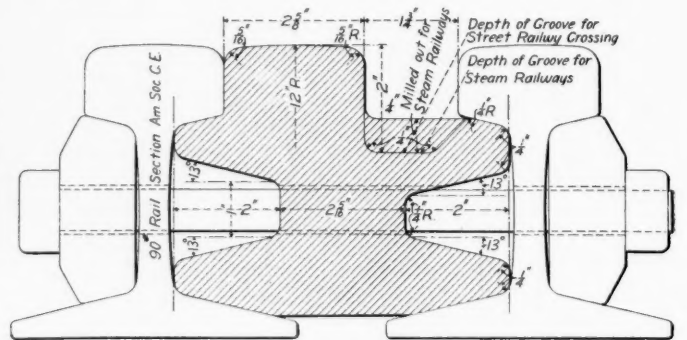


Fig. 4—Detail of Filler Rail.

being put between track and reinforcing rail to make a strong splice at this point.

It is claimed for this crossing that it has double the life of the standard crossings now in use; that it saves one-half the cost of maintenance; that it does not require any change or additional cost in present methods of track work; that it costs no more than present standard crossings and can be made with the same shop equipment as the latter. In fact, it is expected that the cost of construction will actually be reduced, as the parts can be assembled with less machine work and labor.

A design of crossing with manganese frogs also has been patented



Fig. 5—Manganese Steel Crossing.

by Mr. Hosmer. A view is shown herewith of one of these crossings (Fig. 5) which has been in service for more than a year. It is at the intersection of the Gulf, Colorado & Santa Fe and the Ft. Worth Belt Railway, and is reported to be in first-class condition, without any cost for maintenance, although it is subjected to quite heavy traffic.

The American Crossing Rail Co., 234 La Salle street, Chicago, has been formed to put these crossings on the market.

ANNUAL REPORTS

BROOKLYN RAPID TRANSIT REPORT FOR YEAR ENDING JUNE 30, 1909.

Comparative Statement of the Results of the Operations of the Brooklyn Rapid Transit System for Years Ending June 30, 1909-1908.

	1909.	1908.	Increase or Decrease.
Gross Earnings from Operation	\$19,694,462.11	19,870,566.55	— 176,104.44
Operating Expenses.....	11,394,654.66	11,939,578.59	— 544,923.93
Net Earnings from Operation	8,299,807.45	7,930,987.96	+ 368,819.49
Income from Other Sources	605,817.21	677,823.94	— 72,006.73
Total Income	8,905,624.66	8,608,811.90	+ 296,812.76
Less Taxes and Fixed Charges	6,969,015.59	6,534,938.62	+ 434,076.97
Net Income	1,936,609.07	2,073,873.28	— 137,264.21
Out of which was taken for Betterments and Additions to Property.....	65,429.82	229,781.18	— 164,351.36
Surplus for the Year, Surplus at June 30, 1908-1907	1,871,179.25	1,844,092.10	+ 27,087.15
Surplus June 30, 1909, and June 30, 1908.....	5,724,639.15	5,578,098.58	+ 146,540.57
Of this amount there has been appropriated:			
For Discount on Bonds Sold	89,575.00	1,457,173.42	— 1,367,598.42
For Depreciation in Securities comprising Guaranty Fund .....	.....	250,835.00	— 250,835.00
Old accounts written off, etc.	8,727.53	16,630.26	— 7,902.73
For additional reserve on account of Special Franchise and Real Estate Taxes in litigation	238,457.25	.....	+ 238,457.25
Expenses of prior years adjusted since June 30, 1908	20,197.24	.....	+ 20,197.24
Loss due to changes, Brighton Line, Fulton to St. Marks, and on discarded materials, etc.	83,376.29	.....	+ 83,376.29
Dividend of 2% on Stock outstanding	897,076.00	.....	+ 897,076.00
Total Appropriations.....	1,337,409.31	1,724,638.68	— 387,229.37
Balance Surplus June 30, 1909, and June 30, 1908.	\$4,387,229.84	3,853,459.90	+ 533,769.94

Comparative Statement of Results of Operations for the Years Ending June 30, 1909, and 1908, shows total earnings from operation of \$19,694,462 for the year 1909, and \$19,870,566 for 1908. The decrease of \$176,104 in gross earnings is distributed as follows:

Passenger Earnings	Increase	\$128,529
Freight Earnings	Decrease	40,125
United States Mail Earnings	Increase	645
American Express Co. Earnings	Decrease	21,596
Advertising	Increase	656
American Railway Traffic Co.	Decrease	244,213

The falling off in freight is explained by general depression in business; the last six months of the fiscal year, however, show an increase over the corresponding period of 1908. The decrease in express is due to the contract with the American Express Company expiring on December 31, 1908, and not renewed; the decrease in the American Railway Traffic Company of \$244,213 is due to contract with the city expiring December 27, 1908, and not renewed.

The influence of the business depression on Passenger Earnings, noted in the last Annual Report, continued to the end of the last calendar year and resulted in a deficit in Gross Passenger Receipts of \$358,479 for the six months (July to December, 1908, inclusive), but beginning with January of this year Passenger Earnings showed an increase, which at the close of the six months ending June, 1909, amounted to \$487,007, or 5.40 per cent., overcoming the decrease of \$358,479, and closing the fiscal year with an increase of \$128,528.

The total cost of Operation for the year ending June 30, 1909, was \$11,394,655, as against \$11,939,579 for the previous year, a decrease of \$544,924, or 4.56 per cent.

The net income from Operation increased \$368,819, or 4.65 per cent.

Taxes show an increase of \$407,613, or 43.83 per cent.

Interest and Rentals show an increase for the fiscal year of \$26,464, or less than 1/2 of 1 per cent.

Surplus Earnings, after making all deductions, were \$1,871,179, an increase of \$27,087, or 1.47 per cent. over the preceding year.

Tabulation No. 1 shows statistics for fiscal years ending June 30, 1902 to 1909, both inclusive. For the last year they are:

Gross Earnings, per Passenger	3.60 Cents.
Miscellaneous, per Passenger .....	.23 "
Total	3.83 "

This Gross Revenue per Passenger is absorbed as follows:

Operating Charges	2.17 Cents.
Taxes .....	.25 "
Interest and Rentals	1.06 "
Surplus .....	.35 "
Total	3.83 "

In the same tabulation is shown the distribution of charges against income on percentage basis for the last two fiscal years, as follows:

	1909. Per Cent. of Earnings.	1908. Per Cent. of Earnings.
For Repairs and Renewals	14.65	14.39
" General Operating	37.48	39.45
" Damages	3.66	4.14
" Legal Expenses	2.07	2.11
For Total Operating	57.86	60.09
For Taxes	6.79	4.68
" Interest and Rentals	25.52	24.80
" Special Appropriations .....	.33	1.15
" Surplus, after all deductions	9.50	9.28
	100.00	100.00

ADDITIONS AND IMPROVEMENTS.

The underground terminal at the Manhattan end of the Williamsburgh Bridge was completed by the city and elevated train service across the Williamsburgh Bridge inaugurated September 16, 1908.

Timber stringers under tracks of the Brooklyn Bridge were replaced by steel beams, and the renewal of ties and other track fixtures is now in progress.

Eighteen thousand feet of single elevated track has been relaid with new rails.

A connection consisting of 2,100 feet of double track was constructed on private right of way between the Sea Beach Railway and the West End Division of the Nassau Electric Railroad immediately north of Coney Island Creek. This enables the Sea Beach Railway trains to run to and from the West End Terminal at Coney Island instead of—as heretofore—inconveniently passing this large traffic through a highly congested and dangerous section at the entrance to Luna Park; and provides a safer, quicker and more economical method of operation.

Approximately 8,500 feet of elevated structure on the Myrtle Avenue Line between Grand Avenue and Broadway was reinforced.

The elevation of surface tracks over Sands Street, Brooklyn, referred to in last year's report, has been completed, and by thus bridging this congested spot, surface car operation has been greatly accelerated not only on the bridge proper, but on all the lines converging at that point. In connection with this improvement, stations were constructed at Sands and High Streets for the transfer of passengers between surface cars and elevated trains for the convenience of local patrons.

48 pieces of special track work were renewed.

The grade of tracks on Sands Street between Pearl and Bridge Streets has been changed to provide clearance for the new Manhattan Bridge approach.

New improved granite pavement on concrete base of about 32,000 feet of single track, amounting to 25,000 square yards, was laid during the year.

2.72 miles of duct was laid in new conduit.

11.63 miles of feeder cable was installed in underground conduits, and overhead cables were reduced by 7.02 miles.

145 miles of trolley wire was renewed.

Work is now under way in rebuilding to standard construction on concrete bed with steel ties the surface lines in Broadway from Driggs to Ralph Avenues and Flatbush Avenue from Fulton Street to Prospect Park Plaza, about 16,000 single track feet having been completed. This, in part, accounts for the \$173,910, or 17 per cent., increase in the cost of Maintenance of Way and Structure in 1909 over 1908.

The tracks of the South Brooklyn Railway formerly serving the Ferry business at the foot of 39th Street were, under an arrangement with the city, extended 1,600 feet to the location of the new slips and ferry house, and the character of the service improved.

The completion of the Brighton Beach Improvement and the inauguration of express service, which the four track construction from Church Avenue to Sheepshead Bay made possible, has induced a great deal of traffic and promises to speedily increase the population density of the entire territory tributary to this line.

The Track and Line Departments Headquarters Building on Nostrand Avenue, mentioned in the last report, was completed and put

into service, not only in connection with both of these departments but for other purposes, resulting in the closing of various segregated plants to the advantage and economy of the service.

Alterations were made in the Canarsie Depot, improving the sanitary conditions and furnishing more comfortable quarters for employes.

The coal storage pocket at the foot of 52d Street was re-arranged to provide for the storage and convenient distribution of coal.

POWER.

One additional steam turbine unit of 10,000 K. W. capacity has been installed in the Williamsburgh Power Station, and the construction of the station in other respects well advanced towards completion.

Water from wells driven on the Company's property is used for boiler purposes at the Central Station, and the purchase of water from the city for this plant has been discontinued.

The Southern Power Station has been closed and is now held as a reserve plant.

The reserve plants now available are as follows:

Third Avenue Power Station	Capacity, 4,400 K. W.
Thirty-ninth Street Power Station	" 3,500 "
Southern Power Station	" 4,200 "

The present rated capacity of the three power stations in active operation—Williamsburgh, Eastern and Central—is 83,500 K. W.

The new sub-station at Thirty-eighth Street, near Fifth Avenue, is completed and in operation with two 2,000 K. W. rotary converters, and the necessary auxiliary apparatus. This station has an ultimate capacity of 10,000 K. W.

Additional rotary converters and auxiliary machinery were installed, as follows:

Hudson Sub-Station	One 2,000 K. W. Machine
Lorimer Sub-Station	One 2,000 " "
Richmond Hill Sub-Station	One 1,000 " "
New Utrecht Sub-Station	One 1,000 " "

thus increasing the total capacity of sub-stations by 10,000 K. W.

During the year the cost of power plant operation was reduced

Statistical Tabulation No. 1.

COMPARATIVE STATISTICS FOR THE FISCAL YEARS ENDING JUNE 30, 1902-9, BOTH INCLUSIVE.

	1909.	1908.	1907.	1906.	1905.	1904.	1903.	1902.
Passenger Earnings:								
Surface Division	\$11,645,569	11,543,992	11,323,084	11,531,125	10,345,112	9,757,629	9,284,157	9,049,229
Elevated Division	7,413,124	7,386,172	7,120,899	6,055,597	5,304,289	4,671,917	3,802,683	3,272,036
Total Passenger Earnings	19,058,693	18,930,164	18,443,983	17,586,722	15,649,401	14,429,546	13,086,840	12,321,265
Freight, Mail and Express, etc.	635,769	940,403	937,604	886,606	684,044	309,163	193,481	189,357
Other Earnings	605,817	677,824	555,166	323,935	252,135	211,853	277,493	252,046
Total Earnings	20,300,279	20,548,391	19,936,753	18,797,263	16,585,580	14,950,562	13,557,814	12,762,668
Operating Charges	11,460,084	12,169,360	11,907,768	11,021,720	10,257,155	9,144,145	8,139,562	8,268,325
Net Income	8,840,195	8,379,031	8,028,985	7,775,543	6,328,425	5,806,417	5,418,252	4,494,343
Taxes	1,337,620	930,008	893,783	882,862	827,951	748,258	757,788	742,817
Interest and Rentals	5,631,396	5,604,931	5,132,604	4,730,072	4,350,540	4,052,957	3,904,068	3,732,633
Total Fixed Charges	6,969,016	6,534,939	6,026,387	5,612,934	5,178,491	4,801,215	4,661,856	4,475,450
Surplus	\$1,871,179	1,844,092	2,002,598	2,162,609	1,149,934	1,005,202	756,396	18,893
Passenger Earnings	\$19,058,693	18,930,164	18,443,983	17,586,722	15,649,401	14,429,546	13,086,840	12,321,265
Increase over preceding year	0.68%	2.64%	4.87%	12.38%	8.45%	10.26%	6.21%	
Passengers Carried	530,149,597	515,184,967	511,839,437	452,604,203	387,213,469	361,701,049	338,365,269	321,501,524
Increase over preceding year	2.93%	0.65%	13.09%	16.89%	7.05%	6.90%	5.24%	
Transfers Redeemed	141,326,128	128,650,863	136,240,669	96,455,314	70,080,877	67,198,622	69,411,386	67,691,915
Increase over preceding year	9.82%	5.57%	41.25%	37.63%	4.29%	3.18%	2.54%	
Revenue Mileage	74,200,436	73,674,770	68,273,181	63,657,323	57,599,743	54,573,384	52,292,501	52,684,980
Increase over preceding year	0.71%	7.91%	7.25%	10.53%	5.55%	4.36%	0.74%	
Earnings per Revenue Mile	25.7 cts.	25.7 cts.	27.0 cts.	27.6 cts.	27.2 cts.	26.4 cts.	25.0 cts.	23.4 cts.
<i>Units per Passenger.</i>								
Passenger Earnings	3.60 cts.	3.68 cts.	3.60 cts.	3.88 cts.	4.04 cts.	3.99 cts.	3.87 cts.	3.83 cts.
Miscellaneous Earnings .....	.23	.31	.29	.27	.24	.14	.14	.14
Total Earnings	3.83	3.99	3.89	4.15	4.28	4.13	4.01	3.97
Operating Charges	2.17	2.36	2.33	2.43	2.65	2.53	2.41	2.57
Taxes .....	.25	.18	.17	.20	.21	.21	.22	.23
Interest and Rentals	1.06	1.09	1.00	1.04	1.12	1.12	1.16	1.16
Total	3.48	3.63	3.50	3.67	3.98	3.86	3.79	3.96
Surplus	0.35	0.36	0.39	0.48	0.30	0.27	0.22	0.006 cts
<i>Charges Per Cent. of Operating Earnings.</i>								
Repairs and Renewals	14.65	14.39	13.66	13.30	15.13	12.35	9.85	13.81
General Operating	37.48	39.45	39.69	37.95	38.77	40.33	42.67	42.85
Damages	3.66	4.14	3.86	3.48	4.25	4.77	5.31	6.88
Legal Expense	2.07	2.11	1.95	1.79	1.87	1.92	1.89	1.87
Total Operating	57.86	60.09	59.16	56.52	60.02	59.37	59.72	65.41
Taxes	6.79	4.68	4.61	4.78	5.07	5.07	5.70	5.94
Interest and Rentals (net)	25.52	24.80	23.61	23.85	25.10	26.15	27.31	27.82
Special Appropriations	0.33	1.15	2.28	3.14	2.77	2.60	1.57	0.68
Surplus	9.50	9.28	10.34	11.71	7.04	6.81	5.70	0.15
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Statistical Tabulation No. 2.

TAX CHARGES FOR THE FISCAL YEARS ENDING JUNE 30, 1902-9, BOTH INCLUSIVE.

	1909.	1908.	1907.	1906.	1905.	1904.	1903.	1902.
Real Estate	\$307,107.28	187,975.66	178,744.60	178,709.94	185,722.39	174,987.51	146,400.00	138,000.00
Special Franchise	464,526.01	222,517.50	224,980.00	215,900.00	205,800.00	187,800.00	187,800.00	187,800.00
Tax on Earnings	220,501.05	217,866.06	214,936.14	204,497.39	174,592.05	160,863.40	147,824.26	146,443.30
Car License	26,589.95	26,051.53	25,138.51	23,598.32	21,935.02	22,469.00	21,824.32	20,773.33
Capital Stock	55,890.00	55,870.00	53,790.00	67,514.96	63,613.13	36,561.87	90,131.20	81,600.00
Bridge Licenses	263,005.85	219,726.72	196,193.19	192,641.41	176,288.55	165,576.53	163,808.63	168,200.68
Total	\$1,337,620.14	930,007.47	893,782.44	882,862.02	827,951.14	748,258.31	757,788.41	742,817.31

Statistical Tabulation No. 3.

CONSTRUCTION EXPENDITURES FOR THE FISCAL YEARS ENDING JUNE 30, 1902-9, BOTH INCLUSIVE.

	1909.	1908.	1907.	1906.	1905.	July 1, 1902 to June 30, 1904.	Total.
Right of Way	\$25,302.13	25,177.32	84,784.72	93,459.87	166,075.83	499,894.99	894,694.86
Track and Roadway	492,756.10	1,607,618.11	1,934,453.57	1,286,718.68	1,311,451.97	809,097.01	7,442,095.44
Electric Line	83,180.92	529,795.80	495,688.36	438,467.54	384,811.55	548,675.15	2,480,619.32
Real Estate	29,122.52	48,117.30	37,367.20	134,851.60	168,804.64	678,422.86	1,096,686.12
Buildings and Fixtures	258,498.27	465,501.51	728,209.56	1,111,659.50	828,584.84	501,660.13	3,894,113.81
Power Plant	901,956.78	1,948,252.38	1,434,318.86	1,718,398.38	387,948.26	2,731,606.02	9,122,480.68
Shop Tools and Machinery	15,278.45	11,150.35	134,623.73	106,397.75	19,878.50	925.00	288,253.78
Cars and Electrical Equipment	154,613.03	1,821,970.47	762,787.39	3,460,833.93	2,254,050.20	4,059,118.11	12,513,373.13
Miscellaneous Equipment	4,863.10	1,052.65	13,166.48	46,480.63	35,995.39	35,130.77	136,689.02
Miscellaneous	5,286.82	18,323.14	77,786.17	16,867.90	39,210.48	44,062.40	201,536.91
Total	\$1,970,858.12	6,476,959.03	5,703,186.04	8,414,135.78	5,596,811.66	9,908,592.44	38,070,543.07

by \$56,900, or over 3 per cent., and the cost per K. W. hour for maintenance and operation from .00862 in 1904 to .00636 in 1909, a decrease of 26 per cent. in five years.

A greater centralization of power production will come with the completion of the Williamsburgh Station, and a further reduction in the cost per K. W. hour may then be expected.

CARS.

Four express cars were converted into mail cars.

825 elevated cars and 1,473 surface cars have been overhauled, repainted and standardized.

The practical completion of standardization of our equipment and centralization of power production has made possible a reduction of \$146,634, or 8 per cent., in the total cost of Maintenance of Equipment for 1909, compared with the fiscal year 1908.

DAMAGES.

The item of Damages, though substantially reduced, is still a burdensome feature of operation, but there was a marked decrease in the number of accidents, both serious and minor, occurring during the year, and a material reduction effected in outstanding claims and pending suits at law, both as to number and gross amount involved. It is reasonable to expect that through steadily improving physical and operating conditions, the exercise of diligence in the detection of fraudulent claims, and readiness to fairly settle just ones, the names of the companies comprised in the system will be less frequently called in Court with each successive term, and incidentally a sometime profitable industry which has been largely monopolized by a class of specialists commonly called Ambulance Chasers will continue to decline.

FREE TRANSPORTATION.

An item of service rendered to the city, which from long practice is taken as a matter of course and passes without special recognition, is the free transportation of policemen and firemen. It is the willing practice to issue books of tickets for the use of uniformed members of the police and fire department and to pass uniformed members of those departments without further formality. The value of this concession to the recipients, and to the city, may be judged by the following figures:

There were issued during the year to Police and Fire Departments 7,630 pass books of 100 fares each, carrying transfer privileges. Counts of several days would indicate that the daily rides of uniformed policemen and firemen average approximately 21,381 rides per day, or 7,804,065 for the year. By applying to pass book tickets the regular rate of fare and to the non-ticket riders the average gross of 3.6 cents received per passenger, it appears that transportation to the current value of \$319,096.44 has been in this form contributed indirectly to the city during the year.

TRANSFERS.

The vitality of the transfer evil is worthy of a better cause. Each year it absorbs far more than its proper share of the lean surplus, or unduly increases the deficit from surface operations. Justice to the paying passenger—if the carrier be left out of consideration—demands that the mistaken theory of "traffic development," under which the reasonable and necessary limitations of this insidious feature of the business have been lost sight of, should be corrected. By referring to table on page 6A, it will be seen that 141,326,128 transfers were redeemed in the last fiscal year—an increase of 110 per cent. over 1904 and 9.8 per cent. over last year, against an increase of 32 per cent. in the gross passenger earnings, 1909 over 1904, and slightly over 1/2 of 1 per cent. in the Gross Passenger Earnings of 1909 over 1908.

TAXES.

The charge to Taxes for the fiscal year was \$1,337,620, or an increase of \$407,612 over the charge during the preceding fiscal year. The sub-division of charges between the various classes of Taxes is shown in Tabulation No. 2. They cover the full liability in all cases except the Special Franchise Tax, against which has been charged somewhat more than the admitted liability, although not the full amount assessed.

Although it is ten years since the Special Franchise Tax Law was first put into effect, there has been no final adjudication by the Courts of the general principles and methods which should control the State Board of Tax Commissioners in determining the value of this class of property, and the owners are still in doubt as to the measure of their liability. In the meantime, approximately three billions of assessments have been levied throughout the State, most of which are still in litigation. It is a fair assumption that the new law is actually yielding less revenue than the old method of taxing only the tangible property. There being no method laid down in the Special Franchise Tax Law by which the Tax Commissioners are directed to value such property, and the Board persisting in its refusal to divulge their methods of appraisal, the resulting assessments seem to be largely a matter of guesswork, reached by no uniform rule and occasioning great inequalities and injustice. The progress of litigation is necessarily slow owing to the amount and complicated nature of the evidence, and while the procedure may be expedited by the operation of a law passed during the recent session of the Legislature at the suggestion of the Attorney-General and Governor, the ultimate status of the assessments will not be known until the highest Court lays

down the general principles and methods which should be followed by the State Board of Tax Commissioners. If the Court of Appeals, in a case now pending before it, should make such a general declaration, the atmosphere would probably be clarified and both the taxing officers and the corporations would better understand where their respective duties and liabilities end; but if no such declaration of principle should be enunciated each case must be determined upon its merits and the litigation will be indefinitely prolonged and the confusion intensified.

The recital of such a condition is enough to condemn any tax law, and the interests of both the State and its creatures, the corporations, imperatively require the modification of the law to the end that its application may be more just and equitable and its operation more direct and certain.

Out of the \$1,337,620 of Taxes charged during the fiscal year all, except \$307,107, or \$1,030,513, are in one sense franchise taxes, being levied either on the right to occupy public streets and places or on the enjoyment of corporate charters. This is equivalent to over 55 per cent. of the net income after deducting other taxes and fixed charges—surely a tremendous burden to carry for corporations created to perform a public service. This amount would pay interest at 5 per cent. upon upwards of \$20,000,000 worth of extensions and improvements.

Neither do these franchise taxes measure the full extent of such burden, for other official impositions, namely, requirements for paving, free transportation, etc., are in a like category as to principle, although not included under the definition of taxes.

It is a conservative estimate that in addition to the taxes enumerated in Tabulation No. 2, the Company contributes to the public, annually, a further sum, estimated at not less than \$200,000 per annum in relieving the city of the expense of maintaining certain portions of pavement in the city streets, shifting tracks for sewers, water mains, etc. This does not take into consideration the item of interest on over four million dollars invested by the Company in paving in various streets which the city would have had to pay had tracks not been there.

The State cannot consistently expect railroad corporations to meet requirements in the transportation of passengers and property, both as to rates and services, and at the same time by the imposition of unreasonable financial burdens cripple their power to discharge their duty.

The inevitable result of such a policy must be either the withdrawal of private capital from such enterprises or their assumption by the State—and in either case the public must be the chief sufferer.

Since the close of the fiscal year an additional tax obligation has been imposed in the shape of a federal corporation tax on net income. This will apply to the present calendar year and thereafter, and on the basis of the net income of the various companies during the calendar year 1908 will apparently cost the companies of the Brooklyn Rapid Transit System about \$50,000, this amount increasing or decreasing annually according to the results of the companies' operations. Inasmuch as your companies get no privileges from the national government not enjoyed by every citizen and already contribute largely to the support of the federal government as a consumer of materials (the manufacture of which is protected by tariff duties), we see no justification for such an additional burden, and it certainly is inequitable to the extent that it is an additional imposition on property already taxed several times and in different ways by the operation of state laws.

INSURANCE FUND.

Of the Insurance Reserve Fund shown on the balance sheet, \$51,428.27 was accumulated prior to November 15, 1907. The balance of \$57,070.16 represents the amount set aside since that date from operations under the Insurance Agreement entered into between the respective companies of the Brooklyn Rapid Transit System, November 15, 1907.

The amount shown on the Balance Sheet, page 21, to the credit of this account, i. e., \$108,498.43, is exclusive of a co-insurer's profit of \$72,642.69, which, based on re-insurance in effect, is estimated will be available for distribution by the Insurance Trustees at the end of the insurance year, November 15, 1909.

From the funds held by the Trustees there has been invested in interest-bearing securities \$103,743.75 (representing a par value of \$110,000), yielding an annual income of \$4,950.

Of the amount charged to insurance for the insurance year ending November 15, 1909, it is estimated that 43 per cent. will represent the co-insurer's profit.

CONDEMNATION OF PROPERTY AT 39TH STREET FERRY.

The Commissioners appointed in the proceeding instituted by the City to acquire various properties adjacent to 39th Street Ferry have awarded to the South Brooklyn Railway Company \$111,830.42 for the thirty-foot strip taken; \$27,110.58 to the Nassau Electric Railroad Company for land under water adjacent to its power house; and nothing to the Brooklyn Heights Railroad Company for deprivation of its terminal rights, although the contract under which such rights were enjoyed stipulated the damage at \$83,545.38 in case the lease of the terminal should be cancelled—this being the amount actually ex-

pended by the lessee upon the terminal building. The Nassau Company and the Brooklyn Heights Company have each objected to those parts of the Commissioners' report which affect them, and the matter has gone to the courts for adjudication.

REFUNDING BONDS.

To June 30, 1909, there had been authenticated and delivered to the Company by the Central Trust Company of New York, Trustee, under the First Refunding Gold Mortgage, dated July 1, 1902, 4 per cent. bonds of a par value of \$46,771,000. This was an increase, during the fiscal year, of \$4,421,000, of which \$3,821,000 were issued for Certificates of Indebtedness of constituent companies, and \$600,000 in exchange for a like amount of Refunding Mortgage Bonds of The Brooklyn City Railroad Company.

The Certificates of Indebtedness were issued at par and represent the actual cost of additions and improvements by constituent companies, while the bonds exchanged were purchased at par and were issued by The Brooklyn City Railroad Company to replace a like amount of matured mortgages on its railroad properties.

Of the 46,771 bonds authenticated and delivered to June 30, 1909, \$33,078,000, par value, have been sold for cash, realizing \$26,676,295.93, and \$979,000, par value, exchanged for stocks and bonds of constituent companies.

On July 1, 1908, there were Brooklyn Rapid Transit Gold Mortgage 4 per cent. bonds in the treasuries of all companies..... \$9,772,000 par value Authenticated and delivered, during the fiscal year ended June 30, 1909..... 4,421,000 " "

Total available.....\$14,193,000 " " Of these there were sold during the year..... 500,000 " "

Leaving on hand June 30, 1909.....\$13,693,000 " "

Of these the Brooklyn Rapid Transit Company owns \$12,714,000, par value, and The Nassau Electric Railroad Company \$979,000, par value.

In addition, the Company has expended to June 30, 1909, \$966,642.66, for which bonds may be issued.

The discount on bond sales during the year was \$89,575, which amount has been charged against the accumulated surplus, as shown by the statement on page 5.

Complete exhibit of issue and disposition of the 1st Refunding Gold Mortgage Bonds outstanding at June 30, 1909, is given below:

Received from Trustee upon execution of Mortgage.... \$ 5,000,000.00 Authenticated from time to time upon deposit with Trustee of Securities and Certificates of Indebtedness of Constituent Companies to the extent of actual cost of improvements..... 41,771,000.00

Total authenticated by Trustee..... 46,771,000.00 Held in Treasury of B. R. T. Co..... 12,714,000.00

Amount outstanding..... 34,057,000.00 Proceeds realized from Sale and Exchange for Underlying Bonds..... 27,655,295.93

Discount (absorbed as indicated below)..... \$ 6,401,704.07

BOND DISCOUNT DISPOSITION:

1903—Charged to Cost of Securities.....	\$1,000,000.00
1904—Charged to Surplus.....	1,153,200.00
1905— " " ".....	1,746,800.00
1906— " " ".....	583,130.41
1907— " " ".....	371,825.24
1908— " " ".....	1,457,173.42
1909— " " ".....	89,575.00

\$6,401,704.07

Appended hereto may be found statements, relating to the business of the fiscal year, and the condition of the Company's affairs on June 30, 1909.

EDWIN W. WINTER,

President.

THE BROOKLYN RAPID TRANSIT CO.

85 CLINTON ST.,
BROOKLYN, N. Y.

COMPARATIVE SUMMARY OF OPERATIONS FOR YEAR ENDING JUNE 30, 1909-S.

	1909.	1908.	Inc. + or Dec. —	Per Cent.
<i>Gross Earnings:</i>				
Passenger.....	\$19,058,693.14	18,930,164.18	+ 128,528.96	.68
Freight, Mail and Express.....	254,642.81	315,719.08	— 61,076.27	19.35
Advertising.....	155,860.31	155,204.65	+ 655.66	.42
American Ry Traffic Co.....	225,265.85	469,478.64	—244,212.79	52.02
Total Earnings from operation.....	\$19,694,462.11	19,870,566.55	—176,104.44	.89
<i>Operating Expenses:</i>				
Maintenance of Way and Structure.....	\$1,194,014.13	1,020,103.81	+ 173,910.32	17.05
Maintenance of Equipment.....	1,690,916.33	1,837,550.29	—146,633.96	7.98
Operation of Power Plant.....	1,596,759.17	1,653,727.74	— 56,968.57	3.44

COMPARATIVE SUMMARY OF OPERATIONS—Continued.

	1909.	1908.	Inc. + or Dec. —	Per Cent.
Operation of Cars.....	\$4,812,555.95	\$4,979,756.57	—167,200.62	6.07
Damages and Legal Expenses.....	1,129,396.31	1,242,361.24	—112,964.93	9.09
General Expenses.....	676,665.93	651,669.03	+ 24,996.90	3.84
Freight, Mail and Express—Expenses.....	138,644.45	190,885.29	— 52,240.84	27.37
American Railway Traffic Co.—Expenses.....	155,702.39	363,524.62	—207,822.23	57.17
Total Operating Expenses.....	11,394,654.66	11,939,578.59	—544,923.93	4.56
Net Earnings from Operation.....	\$8,299,807.45	7,930,987.96	+ 368,819.49	4.65
<i>Income from Other Sources:</i>				
Rent of Land and Buildings.....	\$74,948.65	63,836.85	+ 11,111.80	17.41
Rent of Tracks and Structure.....	104,997.11	101,419.29	+ 3,577.82	3.53
Miscellaneous.....	425,871.45	512,567.80	— 86,696.35	16.91
Total Income.....	\$8,905,624.66	8,608,811.90	+ 296,812.76	3.45
<i>Deductions:</i>				
Taxes.....	\$1,337,620.14	930,007.47	+ 407,612.67	43.83
Interest and Rentals (Net).....	5,631,395.45	5,604,931.15	+ 26,464.30	.47
Total Deductions.....	6,969,015.59	6,534,938.62	+ 434,076.97	6.64
Net Income.....	1,936,609.07	2,073,873.28	—137,264.21	6.62
Special Appropriations.....	65,429.82	229,781.18	—164,351.36	71.53
Surplus.....	\$1,871,179.25	1,844,092.10	+ 27,087.15	1.47

CONSOLIDATED GENERAL BALANCE SHEET, JUNE 30, 1909.

Assets.	
COST OF ROAD AND EQUIPMENT.....	\$123,224,564.22
Properties owned in whole or in part by B. R. T. Co.....	
ADVANCES ACCOUNT OF CONSTRUCTION FOR LEASED COMPANIES.....	10,900,769.27
The Brooklyn City Railroad Co.....	\$9,399,121.42
Prospect Park & Coney Island R. R. Co.....	1,501,647.85
CONSTRUCTION EXPENDITURES, CONSTITUENT COMPANIES.....	966,642.66
To be reimbursed by issuance of B. R. T. 1st Refunding Gold Mortgage 4% Bonds, upon deposit with Central Trust Co., Trustee, of Certificates of Indebtedness to cover.....	
GUARANTY FUND (SECURITIES AND CASH).....	3,754,920.00
UNDERLYING BONDS DEPOSITED WITH CENTRAL TRUST CO., TRUSTEE.....	979,000.00
TREASURY BONDS.....	13,781,500.00
B. R. T. Co.'s 1st Ref. Gold Mortgage 4%.....	\$13,678,000.00
Other Issues.....	103,500.00
TREASURY STOCK.....	146,228.00
CURRENT ASSETS.....	3,224,767.51
Cash on hand.....	\$1,526,576.07
Due from Companies and Individuals.....	590,653.96
Construction Material and General Supplies on hand.....	833,339.25
Real Estate Mortgages.....	22,500.00
Prepaid Accounts.....	139,034.03
Harway Improvement Co. Stock.....	112,664.20
BONDS AND CASH IN ESCROW.....	57,120.00
TRUSTEES, B. R. T. INSURANCE RESERVE FUND.....	57,070.16
ACCOUNTS TO BE ADJUSTED.....	40,691.64
	\$157,133,273.46

Liabilities.	
CAPITAL STOCK.....	\$45,835,908.98
Brooklyn Rapid Transit Co.....	\$45,000,000.00
Outstanding Capital Stock of Constituent Companies.....	835,908.98
BONDED DEBT AND REAL ESTATE MORTGAGES.....	99,624,680.00
Brooklyn Rapid Transit Co.....	53,771,000.00
Bonded Debt of Constituent Companies:	
The Brooklyn Heights R. R. Co.....	250,000.00
The Nassau Electric R. R. Co.....	15,000,040.00
Brooklyn, Queens Co. & Sub. R. R. Co.....	6,624,000.00
Brooklyn Union Elevated R. R. Co.....	23,000,000.00
Sea Beach Railway Co.....	650,000.00
Real Estate Mortgages.....	329,640.00
CURRENT LIABILITIES.....	6,948,312.49
Audited Vouchers.....	1,161,826.46
Due Companies and Individuals.....	171,230.79
Taxes Accrued and not Due.....	1,570,172.15
Interest and Rentals Accrued and not Due.....	645,083.09
Bills Payable.....	3,400,000.00
CONTRACTORS' DEPOSITS.....	42,120.00
LONG ISLAND TRACTION CO. TRUST FUND.....	9,280.15
ACCOUNTS TO BE ADJUSTED.....	34,145.49
INSURANCE RESERVE FUND.....	108,498.43
CONTINGENT RESERVE FUND.....	143,098.08
SURPLUS.....	4,387,220.84
	\$157,133,273.46

NOTE.—The Certificates of Indebtedness issued by Constituent Companies, aggregating \$37,518,908.10 against which B. R. T. Bonds have been issued, do not appear separately on this Consolidated Balance Sheet, as the property purchased appears as an asset under the head of "Cost of Road and Equipment," and "Advances Account of Construction for Leased Companies," and the liability is represented by the Bonds of the Brooklyn Rapid Transit Company, issued from time to time as such Certificates of Indebtedness are acquired and deposited with the Central Trust Co., Trustee.

THIRTY-FIRST ANNUAL REPORT OF THE CHESAPEAKE & OHIO RAILWAY COMPANY.

Richmond, Vt., August 19th, 1909.

TO THE STOCKHOLDERS:

The Thirty-first Annual Report of the Board of Directors for the fiscal year ending June 30th, 1909, is herewith submitted:

Miles in operation.	June 30th, 1909.	Comparison with June 30th, 1908.	Inc. or dec.
OWNED.			
Fort Monroe, Va., to Covington, Ky., (287.1 miles double track)	663.1		
Richmond to Clifton Forge, Va., via Lynchburg (9.5 miles double track)	229.9		
Whitcomb to Winterburn, W. Va.	100.8		
Barboursville to Ethel, W. Va.	71.6		
*Branch lines in Virginia and West Virginia	270.1	Inc., 2.0	
Denton to Lexington, Ky. (1.2 miles double track)	102.7		
Big Sandy Junction to Elkhorn City, Ky.	127.7		
Branch lines in Kentucky	55.5	Inc., 1.2	
	1,621.4	Inc., 3.2	
OPERATED THROUGH STOCK OWNERSHIP.			
Cov. & Cin. El. R.R. and T. & B. Co.—Covington, Ky., to Cincinnati, O. (double track)	1.8		
Coal River Railway	63.5	Inc., 63.5	
	65.3	Inc., 63.5	
LEASED.			
Orange Branch, Southern Railway—Orange to Gordonsville, Va.	9.0		
Sulphur Mines R.R.—Mineral to Sulphur Mines, Va.	4.0		
Keeney's Creek R.R.—Nuttall to Lookout, W. Va.	7.8		
	20.8		
TRACKS OF OTHER COMPANIES USED JOINTLY.			
Washington Terminal Co., Philadelphia, Baltimore & Washington R.R., and Washington Southern Ry.—Washington, D.C., to Washington Southern Junction, Va. (double track)	9.1		
Southern Ry.—Washington Southern Junction to Orange, Va. (double track)	76.4		
Baltimore & Ohio R.R.—Lexington, Va.	1.0		
Norfolk & West'n Ry.—Loch Laird to Glasgow, Va.	8.3		
Ashland Coal & Iron Ry.—Ashland Junction to Denton, Ky.	21.3		
Louisville & Nashville R.R.—Lexington to Louisville, Ky. (12 miles double track)	84.4		
	200.5		
Grand total	1,908.0	Inc., 66.7	
Average mileage operated	1,896.6	Inc., 56.3	
First track, owned, operated and leased	1,707.5	Inc., 66.7	
First track used jointly	200.5		
Second track owned	304.2	Inc., 21.8	
Second track used jointly	97.5		
Sidings, owned	753.9	Inc., 19.2	
Total, all tracks	3,063.6	Inc., 107.7	

Mileage "owned," increased by extension of Potts Creek Branch, Jordan Junction to Bess, Va., 2.0 miles; and by extension of Marrowbone Branch, Hellier to Beddow, Ky., 1.2 miles
 Mileage "operated through stock ownership," increased by mileage of Coal River Railway from St. Albans to Clothier, W. Va., 49.5 miles, and from Sproul to Peytona, W. Va., 14 miles.

GENERAL INCOME ACCOUNT.

	1909.	1908.	Increase or decrease
OPERATING REVENUES.			
From Freight Traffic, \$20,885,511.21	\$19,571,609.17	Inc., \$1,313,902.04	
" Passenger Traffic 4,482,004.33	5,120,528.63	Dec., 638,524.30	
" Transportation of Mails 388,453.09	395,714.40	Dec., 7,261.31	
" Transportation of Express 407,574.61	407,976.18	Dec., 401.57	
" Other Transportation 342,672.06	219,357.30	Inc., 123,314.76	
" Non-Transportation 124,502.48	128,086.59	Dec., 3,584.11	
Total Operating Revenues	\$26,630,717.78	\$25,843,272.27	Inc., \$787,445.51
OPERATING EXPENSES.			
For Maint. of Way and Structures \$3,101,150.94	\$3,135,354.40	Dec., \$34,203.46	
" Maintenance of Equipment 4,938,938.04	5,369,463.91	Dec., 430,525.87	
" Traffic 466,642.42	470,956.76	Dec., 4,314.34	
" Transportation 7,328,683.05	7,770,757.08	Dec., 442,074.03	
" General 532,023.50	440,215.02	Inc., 91,808.48	
Total Operating Expenses	\$16,366,837.95	\$17,186,747.17	Dec., \$819,909.22
Net operating revenues \$10,263,879.83	\$8,656,525.10	Inc., \$1,607,354.73	
To which add:			
Income from other sources	708,863.34	762,831.96	Dec., 53,968.62
Gross Income	\$10,972,743.17	\$9,419,357.06	Inc., \$1,553,386.11
From which deduct:			
Interest, Funded Debt 4,456,085.01	4,168,603.45	Inc., \$287,481.56	
Taxes 801,600.00	791,060.97	Inc., 10,539.03	
Interest, Equipment Trusts 524,946.68	607,346.63	Dec., 82,399.95	

*Includes 5.0 miles of Alberene Branch, Esmont to Alberene, Va., leased to Nelson & Albemarle Railroad.

Interest, General Account and Collateral Notes	450,000.00	411,922.85	Inc., 38,077.15
Rentals Leased Roads, Joint Tracks, &c.	626,649.37	593,781.73	Inc., 32,867.64
Loss on C. & O. Grain Elevator	59,722.01	62,254.92	Dec., 2,532.91
Other Deductions	41,612.93	.....	Inc., 41,612.93
Total Deductions	\$6,960,616.00	\$6,634,970.55	Inc., \$325,645.45
Net Income	4,012,127.17	2,784,386.51	Inc., 1,227,740.66
From this Net Income for Year ending June 30th, 1909.	\$4,012,127.17		
There have been deducted:			
One-half the amount paid on account of principle of Equipment Trusts	\$1,005,000.00		
Extraordinary Expenditures for Improvements	212,449.03		
Greenbrier Railway Sinking Fund	19,400.00		
Dividend No. 10 of 1% paid December 22nd, 1908	627,907.00		
Dividend No. 11 of 1% paid June 28th, 1909	627,907.00	\$2,492,663.03	
Balance transferred to credit of Profit and Loss		\$1,519,464.14	
Amount to credit of Profit and Loss, June 30th, 1908	\$1,174,910.08		
From which have been deducted:			
Discount on Coal River R'y, Potts Creek Branch, Big Sandy R'y, General Funding and Improvement Mortgage Bonds sold and premium on Collateral Notes purchased—less premium on General Mortgage Four and one-half per cent. Bonds sold	\$719,860.00		
Old Securities and Accounts written off—less sundry credits	100,659.09	\$820,519.00	\$354,390.99
			\$1,873,855.13

CAPITAL STOCK AND FUNDED DEBT.

	June 30, 1909.	June 30, 1908.	No change.
Capital stock	\$62,799,100.00	\$62,799,100.00	
Funded debt	101,819,000.00	99,768,000.00	Inc. \$2,051,000.00
	\$164,618,100.00	\$162,567,100.00	\$2,051,000.00

The increase in Funded Debt of \$2,051,000.00 is due to the issuance of \$11,000,000.00 General Funding and Improvement Mortgage 5% Bonds under the terms of the Mortgage dated January 2nd, 1909, and \$840,000.00 General Mortgage 4 1/2% Bonds for second track construction, and the cancellation of \$9,750,000.00 General Equipment and Improvement Mortgage 5% Bonds, referred to in last annual report as collateral pledged for short term notes, and the retirement (under Sinking Fund provision) of \$39,000.00 Greenbrier Railway First Mortgage 4% Bonds.

Extraordinary expenditures charged to income were as follows:

Business and Other Sidings	\$3,034.13
Various New Stations and Water Tanks	11,574.34
Filling Trestles, Guyandotte Valley Branch	169,197.49
Ashland Undergrade Crossing	5,176.43
Contributions towards Construction R. R. Y. M. C. A. Buildings	14,529.50
Reconstructing County Roads and Land Damages	3,496.24
Reconstructing Chickahominy Trestles	1,736.05
Improvements Richmond and Covington Shops and Fort Monroe Terminal	2,660.42
Sundry Surveys	667.25
Leonard Block Signals	377.18
Total	\$212,449.03

COST OF ROAD JUNE 30, 1909.

The Cost of Road as of June 30, 1908, was	\$137,815,192.39
ADD FOR COST OF:	
New Second Track	\$637,295.57
Changes of Line and Grade	934,470.83
Sidings and Yards	165,886.82
Shops Machinery and Tools	5,932.15
Depots at Lester and Dacota, W. Va.	5,036.54
Interlocking Block and Other Signals	68,446.56
Improvements, Eight-St. Basin, Richmond, Va.	1,155.59
Water Softening Plant, Covington, Ky.	1,373.32
Water Supply Plant, Huntington, W. Va.	8,709.21
Bridge, Station, etc., Elkhorn City, Ky.	17,500.00
Bridge and Crossing 6th Street, Richmond, Va.	1,290.08
Extension Culvert, Ashland, Ky.	2,348.08
Telephone Lines	1,271.99
Additions to Ventilating Plant—Big Bend Quarry Cars for Ballast Plant at Frazier, W. Va.	380.75
Real Estate various places	1,994.40
	12,674.07
Less:	
Sundry Credits	\$1,863,765.96
	42,838.41
	1,820,927.55
Cost of Road, as per Balance Sheet	\$139,636,119.94

COST OF EQUIPMENT JUNE 30, 1909.

The Cost of Equipment, June 30, 1908,			
was		\$14,417,508.48	
Add for:			
One-half the amount paid on account of			
principal of Equipment Trusts.....	\$1,005,000.00		
Two Parlor Cars.....	23,862.78	1,028,862.78	
Cost of Equipment, as per Balance Sheet.....		\$15,446,371.26	
Equipment in service, June 30th, 1909:			
Locomotives owned	459	Inc.	2
Locomotives leased (under Equipment Trusts)....	213		
Passenger Cars owned.....	306	Inc.	4
Freight and Miscellaneous Cars owned.....	17,993	Dec.	52
Freight Cars leased (under Equipment Trusts)....	17,205		

Fifteen light locomotives were dismantled and the same number of consolidation freight locomotives purchased and the excess of value charged to Equipment-Replacement Accounts. Two locomotives were received with the Coal River Railway.

Two mail and express, three dining and two parlor cars were added to the equipment; the cost of the mail and express cars and dining cars was charged to Equipment-Replacement Accounts. Four dining cars were converted into coaches; one coach and one combination car were received with the Coal River Railway.

There were 294 freight and miscellaneous cars dismantled, and 242 cars added to the equipment, including 15 received with the Coal River Railway; 507 steel gondola cars have been purchased for delivery in August. Their cost will be charged to Equipment-Replacement Accounts. This number, added to the 227 so charged during the year, fully replaces the number dismantled during the year, and the number short at the close of the previous year.

Operating Expenses (Maintenance of Equipment) and Outside Operations (Ferry Lines, Harbor Terminal Transfers and Dining and Special Car Service) were charged and Equipment-Replacement Accounts credited as follows:

Balance to the credit of the Account June 30, 1908	\$366,565.29
Charged to Operating Expenses year ending June 30, 1909:	
For Renewals of Equipment.....	\$230,149.11
For Depreciation of Equipment.....	564,955.72
	795,104.83
Charged to Outside Operations in the same period:	
For Renewals of Equipment.....	19,779.39
For Depreciation of Equipment.....	16,075.17
	35,854.56
	\$1,197,524.68
Add Salvage on Equipment retired.....	85,584.17
Total amount credited to Equipment-Replacement Accounts year ending June 30, 1909.....	\$1,283,108.85
Against this amount charges have been made:	
For cost of 15 locomotives, 227 freight and 5 passenger cars	\$464,247.89
For betterments to 125 gondola cars.....	6,686.25
	\$470,934.14
Amount remaining to credit Equipment-Replacement Accounts, June 30, 1909.....	\$812,174.71
Amount to be charged as cost of 507 steel gondola cars, to be received in July and August, 1909.....	487,825.26
Balance to credit after providing for the necessary Equipment Replacements	\$324,349.45
Equipment-Trust payments for the year amounted to \$2,010,000 on account of principal and \$524,946.68 on account of interest. Under the terms of the General Funding and Improvement Mortgage, \$1,000,000 of the bonds issued under said mortgage will be delivered to your treasury in reimbursement for one-half of the principal, and	

this amount has been charged to Cost of Equipment; the remainder has been charged to Income.

The outstanding Equipment Trust Certificates on June 30th, 1909, were \$12,410,000.

Your Directors have authorized the purchase of thirty-five freight locomotives, and thirty-five hundred 50-ton capacity steel gondola cars in addition to the locomotives and cars referred to above. The locomotives and twenty-two hundred of the freight cars will be provided for through Capital Account; the balance, thirteen hundred freight cars, will be charged against the Equipment-Replacement Accounts, as a large number of old coal cars of twenty-five and thirty-ton capacity, now obsolete, will be retired from service during the present year. Upon delivery of the equipment contracted for, your Company will have in service twenty thousand steel coal cars with a capacity of fifty tons each.

The following comparison indicates the changes in Equipment during a period of nine years:

EQUIPMENT OWNED.	June 30, 1909.	June 30, 1900.		
Locomotives	459			
Locomotives Ordered	35	494	375	Inc. 119
Passenger Cars		306	221	" 85
Freight and Miscellaneous Cars, 17,993				
Freight Cars ordered.....	4,007	22,000	12,371	Inc. 9,629
EQUIPMENT LEASED UNDER EQUIPMENT TRUSTS.				
Locomotives	213			Inc. 213
Freight Cars	17,205	4,899		" 12,306
TOTAL EQUIPMENT OWNED AND LEASED UNDER EQUIPMENT TRUSTS.				
Locomotives	707	375	Inc.	332
Passenger Cars	306	221	"	85
Freight and Miscellaneous Cars.....	39,205	17,270	"	21,935

FREIGHT TRAFFIC STATISTICS—ALL LINES OPERATED.

	Year Ending June 30th, 1909.	Comparison with June 30th, 1908.	
		Increase or Decrease.	Per Cent.
Miles	1,896.6	1.	56.3 3.1
Freight revenue	\$20,885,511.21	1.	\$1,313,902.04 6.7
Per cent. of gross revenues.....	78.4	1.	2.7 3.5
Coal and coke carried (tons)....	12,795,786	1.	1,939,513 17.9
Other freight carried (tons)....	5,715,576	1.	31,016 0.5
Number of tons carried, total....	18,511,362	1.	1,970,529 11.9
Number of tons carried one mile.	5,095,552.874	1.	570,239.660 12.6
Average miles each ton was carried	275	1.	1 0.4
Number of tons carried per mile of road	9,760	1.	772 8.6
Number of tons carried one mile per mile of road.....	2,686,677	1.	227,669 9.3
Freight revenue per mile of road	\$11,012.08	1.	\$377.07 3.5
Average revenue per ton.....	\$1,32.8	D.	\$0.05.5 4.6
Average revenue per ton of coal per mile (mills).....	3.19	D.	.07 2.1
Average revenue per ton of freight other than coal per mile (mills).....	6.67	D.	.29 4.2
Average revenue per ton per mile from all freight (mills)....	4.10	D.	.22 5.1
Average number of tons per loaded car.....	29.7	1.	.6 2.1
Average revenue train load (tons)	675	1.	54 8.7
Average train load, including Company's freight (tons)....	707	1.	55 8.4
Average number of loaded cars per eastbound freight train....	25.9	1.	.7 2.8
Average number of empty cars per eastbound freight train....	11.4	1.	1.0 9.6
Average number of loaded cars per westbound freight train....	19.5	1.	1.6 8.9

EQUIPMENT TRUST OBLIGATIONS, JUNE 30TH, 1909.

Date of Agreement.	Series.	Description of Equipment.	Date of Final Payment.	Payments Made During Year Ending		Balance June 30th 1909.
				June 30th, 1908.	June 30, 1909.	
August 1st, 1901.....	"A"	{ 25 Locomotives	August 1st, 1911	\$400,000.00	\$100,000.00	\$300,000.00
August 14th, 1902.....	"B"	{ 25 Locomotives.....	August 15th, 1912.....	1,000,000.00	200,000.00	800,000.00
August 30th, 1902.....	"C"	{ 2,210 Freight Cars.....	September 1st, 1912	450,000.00	100,000.00	350,000.00
July 10th, 1903	"D"	{ 1,000 Gonds. (steel)....	August 1st, 1913	1,200,000.00	200,000.00	1,000,000.00
November 16th, 1903.....	"E"	{ 1,000 Gonds. (steel)....	December 1st, 1913	550,000.00	100,000.00	450,000.00
December 15th, 1904.....	"F"	{ 20 Locomotives	December 15th, 1914....	455,000.00	70,000.00	385,000.00
April 1st, 1905	"G"	{ 500 Gonds. (steel)....	April 1st, 1915	1,260,000.00	180,000.00	1,080,000.00
April 2d, 1906	"H"	{ 18 Locomotives	April 1st, 1916.....	1,280,000.00	160,000.00	1,120,000.00
June 1st, 1906	"I"	{ 1,500 Gonds. (steel)....	June 1st, 1916	800,000.00	100,000.00	700,000.00
August 1st, 1906.....	"J"	{ 35 Locomotives	August 1st, 1916	1,615,000.00	190,000.00	1,425,000.00
October 15th, 1906.....	"K"	{ 995 Gonds. (steel)....	October 15th, 1916.....	1,360,000.00	160,000.00	1,200,000.00
January 2d, 1907.....	"L"	{ 1,000 Gondolas (steel)....	January 1st, 1917	2,024,000.00	226,000.00	1,798,000.00
February 1st, 1907.....	"M"	{ 2,000 Gondolas (steel)....	February 1st, 1917	2,026,000.00	224,000.00	1,802,000.00
		{ 213 Locomotives				
		{ 17,205 Freight Cars.....				
Total Trust Obligations.....				\$14,420,000.00	\$2,010,000.00	\$12,410,000.00
Equipment Trust payments charged:				\$1,005,000.00 to cost of Equipment, and the balance, \$1,005,000, to Income.		

Average number of empty cars per westbound freight train..	17.6	I.	.8	4.8
Average number of loaded cars in train	22.7	I.	1.4	6.6
Average number of empty cars in train	14.5	I.	1.1	8.2
Total cars per freight train.....	37.2	I.	2.5	7.2
*Miles run by freight trains.....	7,549,759	I.	257,064	3.5
Miles run by switch and construction trains	4,151,939	D.	368,710	8.2
Freight car mileage.....	280,814,202	I.	27,680,249	10.9
Loaded car mileage	171,462,969	I.	16,164,099	10.4
Empty car mileage	109,351,533	I.	11,516,150	11.8
Freight train mileage per mile of road	3,980	I.	17	0.4
Freight revenue per freight train mile	\$2 76.6	I.	\$0.08.2	3.1

*Includes mileage made by light trains.

PASSENGER TRAFFIC STATISTICS.

ALL LINES OPERATED.

	YEAR ENDING JUNE 30, 1909.	COMPARISON WITH JUNE 30, 1908.		
		INCREASE OR DECREASE.	PER CENT.	
Miles	1,896.6	I.	56.3	3.1
Passenger revenues	\$4,482,004.33	D.	\$638,524.30	12.5
Per cent. of gross revenues	16.8	D.	3.0	15.2
Number of passengers carried.....	5,097,237	D.	528.71	1.0
Number of passengers carried one mile	217,694,041	D.	69,035,796	24.1
Average miles each passenger was carried	42.71	D.	12.96	23.3
Number of passengers carried per mile of road.....	2,687	D.	112	4.0
Number of passengers carried one mile per mile of road.....	114.781	D.	41,025	26.3
Passenger revenue per mile of road.....	\$2,363.18	D.	\$419.26	15.1
Average revenue from each passenger	\$.88	D.	\$.11	11.1
Average revenue per passenger per mile (cents)	2.059	I.	.273	15.3
Average number of passengers per train mile	57	D.	14	19.7
Passenger train mileage.....	3,817,782	D.	242,736	6.0
Passenger car mileage.....	19,918,828	D.	1,916,791	8.8
Passenger train mileage per mile of road	2.013	D.	.193	8.7
Passenger revenue per train mile.....	\$1.17	D.	\$.09	7.1
Revenue per passenger train mile, including Mail and Express.....	\$1.38	D.	\$.08	5.5

GENERAL REMARKS.

The Net Income for the year after providing for all charges, including interest on Equipment Trust obligations, was \$4,012,127.17.

Deductions were made as follows:

Payments on account of principal of Equipment Trusts..	\$1,005,000.00
Extraordinary Expenditures for Improvements.....	212,449.03
Payments on account of Greenbrier R'y Co. Sinking Fund	19,400.00
Two Dividends on Common Stock paid December 22, 1908, and June 28, 1909 (1¢ each).....	\$1,255,814.00
Leaving a balance to the credit of Profit and Loss.....	\$1,519,464.14

The gross and net revenues for the year are the largest in the history of the Company. The business depression during the first half of the year unfavorably affected the gross earnings, but there was a substantial recovery in the latter half.

Your Directors authorized a General Funding and Improvement Mortgage to be placed on your property to the amount of \$30,000,000, bearing date of January 2, 1909, and running twenty years, and bonds to the amount of \$11,000,000, secured by this mortgage were issued, and the proceeds of this sale in part applied to the cancellation of \$7,500,000 Six Per Cent. Collateral Notes called for payment July 1, 1909; the \$9,750,000 General Equipment and Improvement bonds issued as collateral for these notes have been cancelled, as well as the mortgage for \$10,000,000 securing the issue.

General Mortgage 4½ per cent. bonds, to the amount of \$840,000.00, were issued, and \$750,000.00 sold to reimburse your treasury for funds advanced on double track work; \$90,000.00, of these bonds remain in your treasury.

The second track, 4.9 miles between Oriana and Lee Hall; second track and revision of grade, 7.1 miles between Lightfoot and Diascund (Richmond Division); the second track, 1.1 miles between Jerry's Run and Lewis Tunnel; 3.2 miles between Gauley and Kanawha Falls (Hinton Division), 0.9 mile between St. Albans and Lewis (Huntington Division), and 4.6 miles between Maysville and Lawrence Creek (Cincinnati Division), are completed and in operation. The change of line and grade and the double tracking between Lewis and Barboursville is progressing favorably, and should be completed and in operation November 1, 1909. The construction of a second track on each side of Gladstone Yard (9 miles) is in progress and should also be completed November 1, 1909.

The mileage added to the Coal River Railway during the year was 12.1 miles, and to the Raleigh and Southwestern Railway 8.6 miles, at a cost of \$44,714.16 and \$89,862.12, respectively. Coal River Railway Company bonds to the amount of \$150,000.00, referred to in the last annual report, have been sold. Raleigh and Southwestern Railway Company bonds to the amount of \$500,000.00, have been issued but not sold; \$80,000.00 of these bonds have been used to reimburse your treasury for amounts advanced for construction purposes, and to cancel the notes referred to in the last Annual Re-

port; the remaining bonds are in the treasury of the Raleigh and Southwestern Railway Company subject to sale.

There were 17,554 tons of new and 830 tons of re-rolled steel rails used in renewals, a total of 18,384 tons, or 118.9 miles of track. There are 636.0 miles of main tracks laid with rails weighing 100 lb. per yard; 453.8 miles with 85-lb.; 685.1 miles with 80-lb., 75-lb. and 70-lb., and 232.0 miles with rails of lighter weight; a total of 2,006.9 miles of main track, including branch lines.

There were 1,109,074 ties used in maintaining existing tracks, and 178,225 in new construction, a total of 1,287,299. There were 656,651 yards of ballast used (principally stone), of which 166,413 yards were used in construction work.

Repairs were made to 700 locomotives, 287 passenger train cars, and 87,817 freight train cars. The average amount expended per locomotive operated was \$2,113.12; per passenger car operated \$819.26, and per freight car operated \$63.24. The average capacity of freight cars operated is 43.6 tons, and the average tractive power of freight locomotives 33,926 pounds.

The coal and coke tonnage increased 17.9 per cent.; other freight tonnage increased 0.5 per cent. The total tonnage was 18,511,362 tons, an increase of 11.9 per cent. The ton miles were 5,095,552,874, an increase of 12.6 per cent. The ton mile revenue was 4.10 mills, a decrease of 5.1 per cent. Revenue per freight train mile was \$2,76.6, an increase of 3.1 per cent. The revenue tonnage per train was 675, an increase of 54 tons, or 8.7 per cent.; including Company's freight it was 707 tons, an increase of 8.4 per cent. The average tonnage per loaded car was 29.7, an increase of 2.1 per cent. The number of tons of revenue freight carried one mile per mile of road was 2,686,677, an increase of 9.3 per cent. Freight train mileage was 7,549,759 miles, an increase of 3.5 per cent.

There were 5,097,237 passengers carried, a decrease of 1.0 per cent. The number carried one mile was 217,694,041, a decrease of 24.1 per cent. Passenger revenue was \$4,482,004.33, a decrease of 12.5 per cent. Total passenger train revenues were \$5,278,032.03, a decrease of \$646,187.18. Revenue per passenger per mile was 2.059 cents, an increase of 15.3 per cent. Number of passengers carried one mile per mile of road was 114.781, a decrease of 26.3 per cent. Passenger train mileage was 3,817,782, a decrease of 6.0 per cent. Passenger revenue per train mile was \$1.17, a decrease of 7.1 per cent.; including mail and express it was \$1.38, a decrease of 5.5 per cent. The above comparisons are made with the extraordinary passenger business for several months in the preceding fiscal year, due to the Jamestown Exposition.

An adjustment with the State of Virginia of the local passenger rates within the State has been effected, whereby the rate is advanced to two and one-half cents per mile.

On October 16, 1908, Mr. Hamilton McK. Twombly resigned as a member of your Board, and on October 20, 1908, Mr. George S. Bowdoin was elected in his stead. On February 11, 1909, Messrs. George S. Bowdoin, Martin Erdmann, Thomas P. Fowler, John P. Green, Walter G. Oakman and Samuel Rea resigned as members of your Board, and Messrs. John W. Castles, Edwin Hawley, Henry E. Huntington, Frederic W. Scott, Frank Trumbull and Frank A. Vanderlip were elected in their stead.

On February 23, 1909, Mr. Frank Trumbull was elected Chairman of the Board of Directors, and the following appointments were made: Mr. Decatur Axtell, First Vice-President; Mr. James Stewart MacKie, Secretary and Treasurer; Mr. C. E. Wellford, Assistant Secretary; Mr. C. E. Potts, Assistant Treasurer, and Mr. A. C. Rearick, General Attorney.

On March 18, 1909, Mr. Henry T. Wickham resigned as a member of your Board, and Major James H. Dooley was elected in his stead.

On June 18, 1909, the following appointments were made by the President and confirmed by the Board, effective July 1, 1909: Mr. Henry T. Wickham, Vice-President and General Counsel; Mr. Chas. E. Doyle, Vice-President and General Manager, and Mr. Frank M. Whitaker, Vice-President and Traffic Manager.

Acknowledgments are due to all officers and employes for faithful and efficient service during the year.

By order of the Board of Directors,

FRANK TRUMBULL, *Chairman.*
GEO. W. STEVENS, *President.*

GENERAL BALANCE SHEET, JUNE 30TH, 1909.

GENERAL BALANCE SHEET.

Assets.		Comparison with June 30th, 1908. Increase or Decrease.*
Cost of Road.....	\$139,636,119.94	\$1,820,927.55
Cost of Equipment.....	15,446,371.26	1,028,862.78
Construction—Potts Creek Branch.....	481,700.42	1,756.79
	\$155,564,191.62	
<i>Bonds owned:</i>		
Big Sandy Railway, 1st Mtte. 4% Bonds.....		771,000.00
Chesapeake & Ohio Ry., Potts Creek Br. 1st Mtte. 4% Bonds.....		300,000.00
Chesapeake & Ohio Ry. General Equip. and Imp. 5% Bonds.....		9,750,000.00
Chesapeake & Ohio Ry., General Mtge. 4½% Bonds.....	91,000.00	91,000.00
Other Bonds.....	3,028,401.00	144,834.28
	3,119,401.00	
Stocks owned.....		2,790,898.65
Advances to Controlled Companies.....		1,262,787.18
Special Cash Deposit (unexpended balance of Second Track Fund).....		517,500.00
Special Cash Deposit (unexpended balance of Potts Creek Branch Fund).....		36,595.04
Special Cash Deposit with Trustees.....		35,160.47
		148,049.06
TOTAL INVESTED ASSETS	\$163,326,533.96	\$7,305,448.39
Cost of New Equipment covered by Trust Agreements, less amount charged to In- come and Capital Ac- count.....		12,410,000.00
		2,010,000.00
Special Deposits, for re- demption with inter- est due to date, of Six per cent. Series A Gold Bonds and Six per cent. Series B (and Scrip) Bonds due July 1, 1908....		16,784.91
		2,026,702.80
Special Deposit, for re- demption at 102 and Accrued Interest Six per cent. Collateral Gold and Collateral Gold Six per cent. Notes, called for pay- ment July 1, 1909....		6,615,000.00
		6,615,000.00
CURRENT ASSETS:		
Cash in hands of Treas- urer.....	\$3,894,002.15	1,696,289.93
Cash on Deposit to pay Interest and Divi- dends.....	608,710.06	182,339.50
Cash on Deposit to pay Equipment Trust prin- cipal due July 1, 1909	113,000.00	113,000.00
Due from Agents and Conductors.....	1,372,604.10	582,003.77
Due from Individuals and Companies.....	520,472.05	12,175.13
Traffic Balances.....	825,049.01	284,363.47
Bills Receivable.....		27,220.00
Materials and Supplies.	1,588,702.68	252,902.94
Sundry Accounts.....	132,156.28	132,156.28
	9,054,696.33	2,722,205.14
Total	\$191,423,015.20	\$2,004,916.05

*Decreases in Italics.

Liabilities.		Comparison with June 30, 1908, Increase or Decrease.*
Capital Stock, Common....	\$62,790,700 00	
" " First Prefer- red.....	7,700 00	
" " Second Pre- ferred.....	700 00	
	\$62,799,100 00	
FUNDED DEBT.		
First Con. Mtge., 5% Bonds 1939.....	\$27,858,000 00	
General Mtge., 4½% Bonds, 1992.....	44,413,000 00	\$840,000 00
First Mtge., Peninsula Div., 6% Bonds, 1911.....	2,000,000 00	
First Mtge., line Newport News to Old Point Comfort, &c., 6% Bonds, 1922.....	142,000 00	
First Mtge., R. & A. Div., 4% Bonds 1989.....	6,000,000 00	
Second Mtge., R. & A. Div., 4% Bonds, 1989.....	1,000,000 00	
First Mtge., Craig Valley Br., 5% Bonds, 1940....	650,000 00	
First Mtge., Warm Spg's Val. Br., 5% Bonds, 1941	400,000 00	
First Mtge., Greenb. & N. Riv. R.R. 5% Bonds, 1942	339,000 00	
First Mtge., Kineon Coal Co., 5% Bonds, 1915..	200,000 00	
First Mtge., Greenbrier R'y. 4% Bonds, 1940.....	1,921,000 00	39,000 00
First Mtge., Paint Creek Br., 4% Bonds, 1945....	525,000 00	
First Mtge., Big Sandy R'y. 4% Bonds, 1944.....	4,771,000 00	
First Mtge., Potts Creek Br., 4% Bonds, 1946.....	600,000 00	
Gen'l Equip't and Improve- ment, 5% Bonds, 1917.		9,750,000 00
Gen'l Funding & Improve't. 5% Bonds, 1929.....	11,000,000 00	11,000,000 00
	\$101,819,000 00	\$2,051,000 00
Total Capital Stock and fund- ed debt	\$164,618,100 00	\$2,051,000 00
Balance due on New Equip- ment covered by Trust Agreements.....	\$12,410,000 00	2,010,000 00
Six per cent. Series A Gold Bonds and Six per cent. Series B, (and Scrip) Bonds, due July 1, 1908 and Interest thereon..		16,784 91
		1,996,569 26
Six per cent. Collateral Notes and Premium and Interest thereon called for payment July 1, 1909.....	6,615,000 00	885,000 00
Loans and Bills Payable... Equipment Replacement ac- counts.....	52,150 00	1,497,272 17
	812,174 71	445,609 42
CURRENT LIABILITIES.		
Interest Accrued.....	\$1,156,917 91	77,379 23
Unpaid Interest, including that due July 1, 1908.	559,663 06	107,284.96
Dividends Uncollected by shareholders.....	49,677 00	45,551 00
Unpaid Vouchers and Pay- rolls.....	2,659,902 38	1,102,653 72
Traffic Balances.....	245,517 11	85,998 71
Taxes Accrued.....	353,272 99	35,226 24
Sundry Accounts.....		110,974 49
	\$5,024,950 45	1,188,370 91
Profit and Loss.....	1,873,855 13	698,945 05
Total	\$191,423,015 20	\$2,004,916 05
This Company is also liable as a guarantor of the—		
C. & O. Grain Elevator Co., 1st Mortgage.....	\$820,000 00	
Coal River Railway Co., 1st Mortgage.....	2,250,000 00	
Norfolk Terminal and Trans. Co., 1st Mortgage.....	500,000 00	
Raleigh and Southwestern Railway Co., 1st Mortgage.....	750,000 00	
Western Pocahontas Corporation, 1st Mortgage.....	750,000 00	
Western Pocahontas Corporation, Ext'n Mortgage No.1	114,000 00	
Western Pocahontas Corporation, Ext'n Mortgage No.2	51,000 00	
Louisville and Jeffersonville Bridge Co., 1st Mortgage (C. & O. Prop'n, ½).....	4,500,000 00	
Richmond-Washington Co., Collateral Trust Mortgage (C. & O. Prop'n, ¼).....	9,500,000 00	

L. F. SULLIVAN, Comptroller.

*Decreases in Italics.